

**UPPER DOLORES RIVER AND SILVER CREEK BASIN
WATER QUALITY AND DISCHARGE
MONITORING SUMMARY
Rico, Colorado**

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UPPER DOLORES RIVER AND SILVER CREEK BASIN WATER QUALITY AND DISCHARGE MONITORING SUMMARY RICO, COLORADO

1.0 Introduction

This report includes water quality sampling results and discharge measurement results from the Silver Creek and upper Dolores River basins near the Town of Rico, Colorado. Water Quality samples were collected on June 26 and 27, 2000, from the Blaine adit and St. Louis tunnel discharge, the St. Louis Pond Settling System, Silver Creek, and the Dolores River. Water flow measurements were performed at each sampling site in conjunction with the water quality sampling. Table 1 lists the sampling station locations and site descriptions. Sampling sites in the Silver Creek and Dolores River basins are illustrated on Figures 1 and 2, respectively.

TABLE 1
Sampling Location Summary

SITE ID	SITE DESCRIPTION
SC-1	Silver Creek immediately above Blaine adit discharge
SC-2	Blaine adit discharge immediately prior to entering Silver Creek (Outfall 001)
SC-3	Silver Creek below Blaine adit discharge (VCUP site SVS-5)
DR-1	Dolores River above St. Louis settling pond system
DR-2	Dolores River immediately above St. Louis settling pond system outfall
DR-3	St. Louis tunnel discharge at adit
DR-4 ⁽¹⁾	St. Louis settling pond system at Pond 18 discharge
DR-5	St. Louis settling pond system at Pond 11 discharge
DR-6	St. Louis settling pond system outfall to the Dolores River (Outfall 002)
DR-7	Dolores River below St. Louis settling pond system outfall
DR-8	Geothermal Springs discharge to Dolores River (Pond 5)
DR-9	St. Louis settling pond system at Pond 13 discharge
DR-10 ⁽²⁾	St. Louis settling pond system at Pond 14 discharge
DR-11 ⁽²⁾	St. Louis tunnel discharge to Pond 13 (conveyed via underground culvert)
DR-12 ⁽²⁾	St. Louis tunnel overland discharge to Pond 18
DR-13 ⁽²⁾	St. Louis tunnel channel discharge to Pond 18

(1) Water Quality Sample only at this site.

(2) Discharge measurement only at this site.

The sampling and discharge measurement locations and parameters for analysis were selected to provide data on the Blaine adit discharge, St. Louis tunnel settling pond system, and the associated water quality and flows of Silver Creek and the Dolores River for the spring runoff season. The spring runoff flow conditions are expected to be relatively high in comparison to flows during the rest of the year. The data objectives included:

- Characterizing the water quality of the selected adit drainages and receiving streams for comparison with (1) CDPS Permit Number CO-0029793, expired January 31, 1999, effluent limitations and (2) water quality results from the October, 1999 sampling event.
- Analysis of flow data in the St. Louis Pond Settling System for estimating flows into and out of the system.
- Sampling and flow measurements were taken in June with the objective of obtaining data during a high runoff period. Note that the flow measurements performed at Silver Creek (SC-1 and SC-3) and at the Dolores River (DR-1, DR-2, and DR-7) were not proposed in the scope of work but were added due to low flows in the Dolores River, time availability, and significance of the data.

Several field conditions warrant discussion in relation to meeting the third objective. Though the intent of this sampling event was to collect seasonal data for a relatively high flow period, this year's spring runoff may have been lower and peaked sooner than other years. Several changes were made to the sampling effort. Though flows may have been lower than normal, information is still useful to assess seasonal conditions.

Water samples were analyzed for pH, temperature, conductivity, alkalinity, hardness, total dissolved solids (TDS), and total suspended solids (TSS) plus the trace metals cadmium, copper, iron, lead, manganese, silver, and zinc. The selected analyses correspond to parameters listed in CDPS Permit Number CO-0029793, expired January 31, 1999.

All samples were analyzed for the dissolved fraction of the selected trace metals. The St. Louis tunnel discharge and settling pond system samples were analyzed for both dissolved and total recoverable trace metal concentrations.

Discharge measurements were performed at each water quality sampling location with the exception of Site DR-4 (St. Louis settling pond system at Pond 18 discharge). The Pond 18 discharge (Figure 5) could not be accurately measured with the available equipment and time. Additional discharge measurements were performed at sites DR-10, DR-11, DR-12, and DR-13 to provide data for the pond system flow analysis. Water quality samples were not collected at sites DR-10, DR-11, DR-12, and DR-13.

2.0 Methods and Procedures

2.1 Water Quality Sampling Procedures

Sampling was conducted in accordance with the sampling program used for the Rico site remediation. Lab-certified plastic bottles were used to collect sample water for hardness, TDS, and TSS analyses. Sample water for dissolved metals analysis was first collected in a clean plastic bottle, and within ten minutes, filtered through a 0.45 μ m filter into a sample bottle containing nitric acid preservative. Sample water for total recoverable metals analysis was collected without filtration in a sample bottle containing nitric acid preservative.

Field parameters were measured at the time of sample collection. Field measurement data for pH, temperature, conductivity, and alkalinity were recorded in a logbook and on sample collection forms. Field instruments were calibrated each morning using standard solutions and consistent with manufactures instructions. Copies of all field records are provided in Appendix A.

All sample bottles were labeled to identify sample number, date and time of collection, type of analysis, and appropriate preservative. In addition, sample analysis/chain of custody forms were completed and processed at the time of sample collection. Original chain of custody forms were signed, dated, and placed in the sample shipment container prior to sealing the container for shipment. Copies of all chain of custody information is provided in Appendix A.

2.2 Water Quality Analytical Procedures

All water samples were sent to Alpine Analytical Laboratory in Helena, Montana. Sample analyses were performed according to methods specified in 40 CFR, Part 136 or other methods approved by EPA. Laboratory methods and reporting limits for all parameters are presented in Table 2.

The full analytical report package (Appendix B) includes reference to the analytical methods used, detection limits, and quality control data. Quality control results indicate that the data are acceptable and usable. Results include near-detection level, but reportable, concentrations of total recoverable cadmium (0.13 μ g/L) and dissolved cadmium (0.14 μ g/L), copper (10 μ g/L), lead (0.60 μ g/L), and zinc (20 μ g/L) in the field blank (Appendix B). However, results from field duplicate samples are all within control limits (Appendix B3), and field data are supported by sufficient laboratory backup data and quality control results, to determine that the data are acceptable for the intended use.

TABLE 2**Analytical Procedures Summary**

Parameter	Practical Quantitation Limit	Method
Field Parameters		
pH (s.u.)	---	EPA 150.1
Temperature (°C)	---	Standard Method 2550
Conductivity (µmhos/cm)	---	EPA 120.1
Alkalinity (mg/L as CaCO ₃)	5 mg/L	EPA 310.1
General Parameters		
Hardness (mg/L as CaCO ₃)	0.2 mg/L	EPA 6010/130.2
Total Dissolved Solids (mg/L as TDS)	1 mg/L	EPA 160.1
Total Suspended Solids (mg/L as TSS)	1 mg/L	EPA 160.2
Trace Metals		
Cadmium (µg/L as Cd)	0.02 µg/L	EPA 7131
Copper (µg/L as Cu)	10 µg/L	EPA 6010
Iron (µg/L as Fe)	20 µg/L	EPA 7381
Lead (µg/L as Pb)	0.5 µg/L	EPA 7421
Manganese (µg/L as Mn)	5 µg/L	EPA 6010
Silver (µg/L as Ag)	0.02 µg/L	EPA 7761
Zinc (µg/L as Zn)	10 µg/L	EPA 6010

2.3 Discharge Measurement Procedures

Discharge measurements were conducted in accordance with the measurement procedures used for the Rico site remediation as well as USGS standard discharge measurement procedures. Flows were measured by one of two methods (1) a Marsh-McBirney Model 2000 portable flow meter, or (2) volumetric procedure using a 5 gallon bucket. The volumetric procedure was used at the Blaine adit discharge (Site SC-2), the Geothermal springs (DR-8), the Pond 13 discharge (Site DR-9), and the Pond 13 influent from the St. Louis tunnel (Site DR-11). Volumetric field measurements consisted of three time/volume trials using a stopwatch and a five gallon bucket. The trials were averaged to determine the flow rate (in gallons per minute) at each station. The volume trials were recorded in a logbook. Copies of all field records are provided in Appendix A.

The six-tenths-depth method (for depths between 0.3 feet and 2.5 feet) was selected for the flow meter measurements. This method uses the velocity at six-tenths of the depth as the mean velocity in the vertical direction. This method is generally reliable between depths from 0.3 feet to 2.5 feet. The first step in the measurement procedure was selecting a stream section with the desired characteristics of: parallel flows, smooth streambed with minimal obstructions, a straight channel,

and a flat streambed. The best possible section was selected using these criteria. After selecting the stream section, a measuring tape was stretched across the stream section, perpendicular to the flow, and anchored at both ends. The width of the section was determined and divided into several (10 to 20) vertical sections. Flow measurements of velocity (by the six-tenths-depth method) and water depth were measured at each vertical section using the Marsh-McBirney flow meter and wading rod assembly. The flow meter was set to the 10 second fixed period average mode. Three velocity readings were recorded at each vertical section. Flows were calculated for each stream section using the water depth, horizontal distance, and averaged velocity data. The flow meter measurements were recorded in a logbook (Appendix A) and the discharges calculated on field data sheets (Appendix A).

3.0 Results

3.1 Water Quality Results

Silver Creek Basin. Analysis results from samples collected in the Silver Creek Basin on June 27, 2000, are provided in Table 3. For information purposes, Colorado stream standards for Silver Creek below the Town of Rico's water supply intake (Segment 9) are provided in Table 3. For hardness based standards, a hardness value of 90 mg/L as CaCO_3 was used to calculate standard values. This hardness value was measured in sample SC-3 collected from Silver Creek below the Blaine adit discharge.

At SC-2, flow from the Blaine adit was measured at 1.6 gallons per minute (Figure 3). The discharge was very acidic with a pH of 1.97 and contained high concentrations of total dissolved solids (7,089 mg/L) and dissolved metals (Table 3).

Comparison of the Silver Creek results at SC-3 with Silver Creek stream standards indicates that most concentrations of the measured dissolved trace metals are below applicable standard values. The only exception is dissolved copper. The measured concentration of dissolved copper ($20 \mu\text{g/L}$) exceeds the acute and chronic standard values of $16.1 \mu\text{g/L}$ and $10.8 \mu\text{g/L}$, respectively. The PH value measured at SC-3 (6.32 s.u.) is below the Silver Creek standard range for PH (6.5 - 9.0 s.u.).

Compared to the October 1999 sampling event, concentrations of dissolved trace metals are generally lower in Silver Creek and the Blaine adit discharge. However, concentrations of dissolved trace metals, including dissolved copper, at SC-3 are typically within the range of concentrations measured during VCUP monitoring. The measured pH values, both above and below the Blaine adit discharge, are lower than the values from the October 1999 sampling event and from the range of values during the VCUP monitoring.

TABLE 3

Silver Creek Basin Analysis Results

Parameter	Units	Standard ⁽¹⁾	SC-1	SC-2	SC-3
			Silver Ck above Blaine Adit	Blaine Adit	Silver Ck below Blaine Adit
Field Parameters					
Flow	gpm		1163	1.6	1163
pH	s.u.	6.5 - 9.0	7.41	1.97	6.32
Temperature	°C		10.2	8.0	10.1
Conductivity	µmhos/cm		174.5	8720	185
Alkalinity	mg/L as CaCO ₃		75	<10	78
General Parameters					
Hardness	mg/L as CaCO ₃		116	2,149	90
Total Dissolved Solids	mg/L as TDS		108	7089	127
Total Suspended Solids	mg/L as TSS		1.0	6.0	7.0
Dissolved Trace Metals					
Cadmium	µg/L as Cd	8.8/5.0	1.4	7,000	4.1
Copper	µg/L as Cu	16.1/10.8	10	5,200	20
Iron	µg/L as Fe	/1,000	<20	844,000	60
Lead	µg/L as Pb	80.9/3.4	3.2	505	0.90
Manganese	µg/L as Mn	/1,000	9.6	149,000	230
Silver	µg/L as Ag	1.70/0.27	<0.02	1.4	<0.02
Zinc	µg/L as Zn	/1,100	770	230,000	380
(1) acute/chronic - Colorado stream standards (dissolved metals) for Silver Creek below the Town of Rico's water supply intake (Segment 9). The hardness value measured at the downstream sampling site SC-3 (90 mg/L as CaCO ₃) was used for hardness based standards.					

Dolores River Basin. Samples from the Upper Dolores River Basin were collected on June 27, 2000. Results from Dolores River samples are presented in Table 4 with stream standards for Section 3. For hardness based standards, a hardness value of 148 mg/L as CaCO₃ was used to calculate standard values. This hardness value was measured in sample DR-7, the Dolores River below the St. Louis tunnel settling pond system.

Comparison of the results at DR-1, DR-2, and DR-7 with Dolores River stream standards indicates that the measured concentrations of dissolved metals typically are below standard values. The only exceptions are dissolved copper and zinc. The concentration of dissolved copper measured at DR-2 (30 µg/L) is greater than the acute and chronic standard values of 25.7 µg/L and 16.5 µg/L, respectively. However, the dissolved copper measured downstream at DR-7 (<10 µg/L) grab sample is below the acute and chronic standard values. The measured concentration of dissolved zinc at DR-7 (160 µg/L) (grab sample) is higher than the chronic standard value of 148 µg/L.

Concentrations of dissolved trace metals in the Dolores River are similar to concentrations measured during the October 1999 sampling event.

TABLE 4

Upper Dolores River Analysis Results

Parameter	Units	Standard ⁽¹⁾	DR-1	DR-2	DR-7
			Dolores River above Ponds	Dolores River above Outfall	Dolores River below Ponds
Field Parameters					
pH	s.u.	6.5 - 9.0	7.42	7.23	6.83
Temperature	°C		9.7	9.6	8.6
Conductivity	µmhos/cm		191	232.5	295.8
Alkalinity	mg/L as CaCO ₃		62	112	62
General Parameters					
Hardness	mg/L as CaCO ₃		102	120	148
Total Dissolved Solids	mg/L as TDS		146	178	188
Total Suspended Solids	mg/L as TSS		1.0	1.0	<1.0
Dissolved Trace Metals					
Cadmium	µg/L as Cd	15.4/1.54	0.15	0.20	0.70
Copper	µg/L as Cu	25.7/16.5	<10	30	<10
Iron	µg/L as Fe	/1,000	<20	<20	<20
Lead	µg/L as Pb	180.5/6.8	<0.5	0.70	<0.5
Manganese	µg/L as Mn	/1,000	12	163	443
Silver	µg/L as Ag	4.0/0.63	<0.02	0.08	<0.02
Zinc	µg/L as Zn	163.1/147.8	20	<10	160
(1) acute/chronic - Colorado stream standards (dissolved metals) for the Dolores River Segment 3. The hardness value measured at the downstream sampling site DR-7 (148 mg/L as CaCO ₃) was used for hardness based standards.					

St. Louis Settling Pond System. Sample results from the St. Louis tunnel settling pond system are presented in Table 5. For purposes of comparison, the 30-day average effluent limitations for Outfall 002 (CDPS Permit Number CO-0029793, expired January 31, 1999) are presented in Table 5. Samples were collected at the St. Louis tunnel discharge at adit (Figure 4), Pond 18 discharge (Figure 5), Pond 13 discharge, Pond 11 discharge, Pond 5 Geothermal Spring (Figure 6), and Outfall 002 (Figure 7). The total recoverable trace metal results from Outfall 002 for cadmium and zinc exceed the 30-day average effluent limitation value. The total recoverable concentrations of cadmium and zinc in the Pond 18, Pond 13, Pond 11, and St. Louis tunnel discharges also exceed the effluent limitation values. Total recoverable concentrations of copper in the Pond 18 and St. Louis tunnel discharges are also greater than the effluent limitation value of 24 µg/L. Concentrations of measured total recoverable metals in samples collected from the Pond 5 Geothermal Spring are near or below the 30-day average effluent limitation value.

Compared to the October 1999 sampling event, concentrations of dissolved and total recoverable trace metals are generally lower throughout the St. Louis tunnel settling pond system. Copper concentrations at the tunnel discharge (DR-3) were the most notable exception. A total recoverable copper concentration of 300 $\mu\text{g/L}$ was measured at the tunnel discharge, but copper concentrations were not detected during the 1999 sampling event. Although measured values of pH and concentrations of hardness in the pond system are slightly lower than those measured in 1999, concentrations of alkalinity and total dissolved solids are similar to 1999 concentrations.

TABLE 5

St. Louis Tunnel Settling Pond System Analysis Results

Parameter	Units	Effluent Lim. ⁽¹⁾	DR-3	DR-4	DR-5	DR-6	DR-8	DR-9
			Tunnel Discharge	Pond 18 Discharge	Pond 11 Discharge	Outfall 002	Geo. Spring	Pond 13 Discharge
Field								
pH	s.u.	6.5 - 9.0	6.58	6.88	6.96	6.77	6.53	6.81
Temperature	°C		16.1	18.2	15.2	15.1	40.2	16.2
Conductivity	µmhos/cm		1,065	1,072	1,088	1,149	2846	1236
Alkalinity	mg/L as CaCO ₃		67	86	66	107	1180	51
General								
Hardness	mg/L as CaCO ₃		689	⁽²⁾	701	793	1189	733
TDS	mg/L as TDS		955	974	962	1070	1660	1155
TSS	mg/L as TSS		14	3.0	2.0	5.0	26	4.0
Dissolved Trace Metals								
Cadmium	µg/L as Cd		18	10	6.3	5.9	0.11	10
Copper	µg/L as Cu		30	<10	<10	<10	<10	<10
Iron	µg/L as Fe		350	<20	<20	<20	3,880	<20
Lead	µg/L as Pb		<0.5	<0.5	<0.5	<0.5	0.50	<0.5
Manganese	µg/L as Mn		2,660	2,650	2,550	1,970	1,200	4,840
Silver	µg/L as Ag		<0.02	<0.02	0.05	0.05	<0.02	0.06
Zinc	µg/L as Zn		3,600	2,620	1,790	1,410	90	1,970
Total Recoverable Trace								
Cadmium	µg/L as Cd	/0.4	15	14	6.8	8.6	0.13	12
Copper	µg/L as Cu	/24	100	40	<10	<10	<10	<10
Iron	µg/L as Fe		3,210	210	580	450	4,690	960
Lead	µg/L as Pb	/9.9	1.6	0.80	<0.5	<0.5	0.60	<0.5
Manganese	µg/L as Mn		2730	2,700	2,670	2,070	1,220	5,160
Silver	µg/L as Ag	/0.1	<0.02	0.02	0.04	0.05	0.09	0.09
Zinc	µg/L as Zn	/237	3,670	2,780	2,170	1,530	270	2,420

(1) daily maximum/30-day average - St. Louis Tunnel Outfall 002 Effluent Limitations (CDPS Permit Number CO-0029793, expired January 31, 1999)

(2) the DR-4 Hardness value reported from the analytical laboratory (Appendix B) was inconsistent with the hardness and TDS data set. Therefore, the value was not included in Table 5.

3.2 Discharge Measurement Results

Flow measurement results from the Silver Creek Basin, the Dolores River, and the St. Louis settling pond system conducted June 26 and 27, 2000 are provided in Table 6. The Sites are listed in order of upstream to downstream and include the measurement method used for each. In addition to Table 6, sampling sites in the Silver Creek and Dolores River basins are illustrated on Figures 1 and 2, respectively.

TABLE 6
Discharge Measurement Results

Site ID	Site Description	Measurement Method	Flow (cfs)	Flow (gpm)
Silver Creek Basin				
SC-1	Silver Creek above Blaine adit discharge	Flow meter	2.59	1,163
SC-2	Blaine adit discharge (Outfall 001)	Bucket	0.003	1.6
SC-3	Silver Creek below Blaine adit discharge	Flow meter	2.59	1,163
Dolores River				
DR-1	Dolores River above St. Louis settling ponds	Flow meter	40.1	17,989
DR-2	Dolores River above settling pond Outfall 002	Flow meter	47.4	21,275
DR-7	Dolores River below settling pond Outfall 002	Flow meter	57.7	25,763
St. Louis Settling Pond System				
DR-3	St. Louis tunnel discharge at adit	Flow meter	1.46	655
DR-11	St. Louis tunnel discharge to Pond 13	Bucket	0.19	85
DR-12	St. Louis tunnel overland discharge to Pond 18	Flow meter	1.07	480
DR-13	St. Louis tunnel channel discharge to Pond 18	Flow meter	0.68	305
DR-9	Pond 13 Effluent	Bucket	0.03	12
DR-10	Pond 14 Effluent	Flow meter	1.06	476
DR-5	Pond 11 Effluent	Flow meter	1.08	485
DR-6	St. Louis settling pond system outfall (Outfall 002)	Flow meter	0.93	417
DR-8	Geothermal springs discharge to Dolores River	Bucket	0.03	11.9

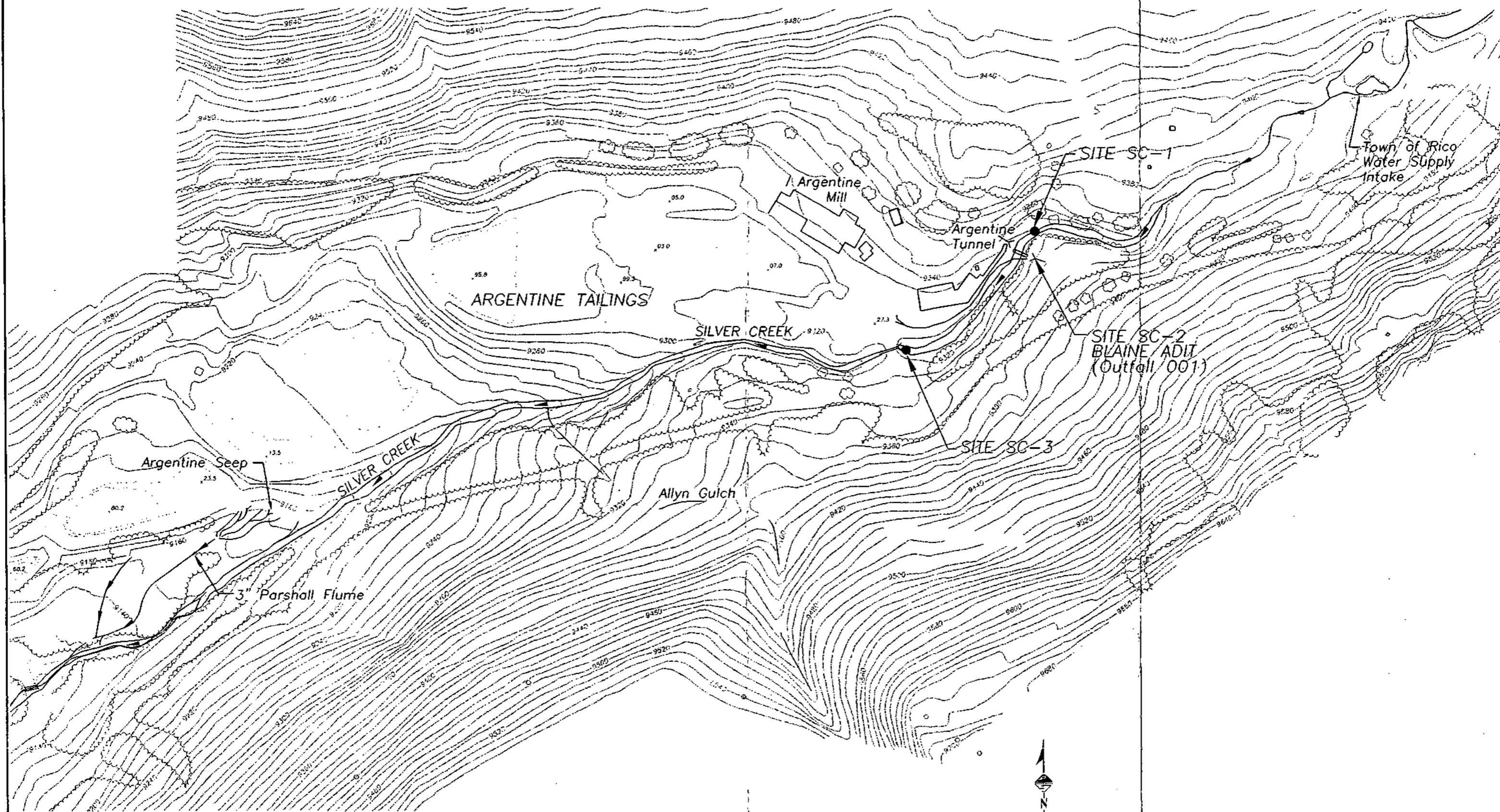
Silver Creek Basin. Flow results in Silver Creek above and below the Blaine adit, SC-1 and SC-3 respectively, were both measured at 2.59 cfs on June 27, 2000. Due to the close proximity of these stations and the relatively low flow of the Blaine adit, the flow results raise confidence in the measurement equipment and techniques. The Blaine adit flow (Figure 3) of 1.56 gpm is slightly higher than the 1.4 gpm measurement of October 25, 1999. Although not significant, the slight increase in flow may be attributed to the spring runoff. Typically, the spring runoff peak flow for the Blaine adit lags the peak flow in the Dolores River by four to six weeks.

Dolores River Basin. USGS provisional data (subject to revision) indicate that the Dolores River flow near Rico peaked on May 24, 2000 at 730 cfs. The Dolores River flow measurement results (Table 6) indicate an increase in flow of approximately 17.6 cfs between DR-1 (40.1 cfs) and

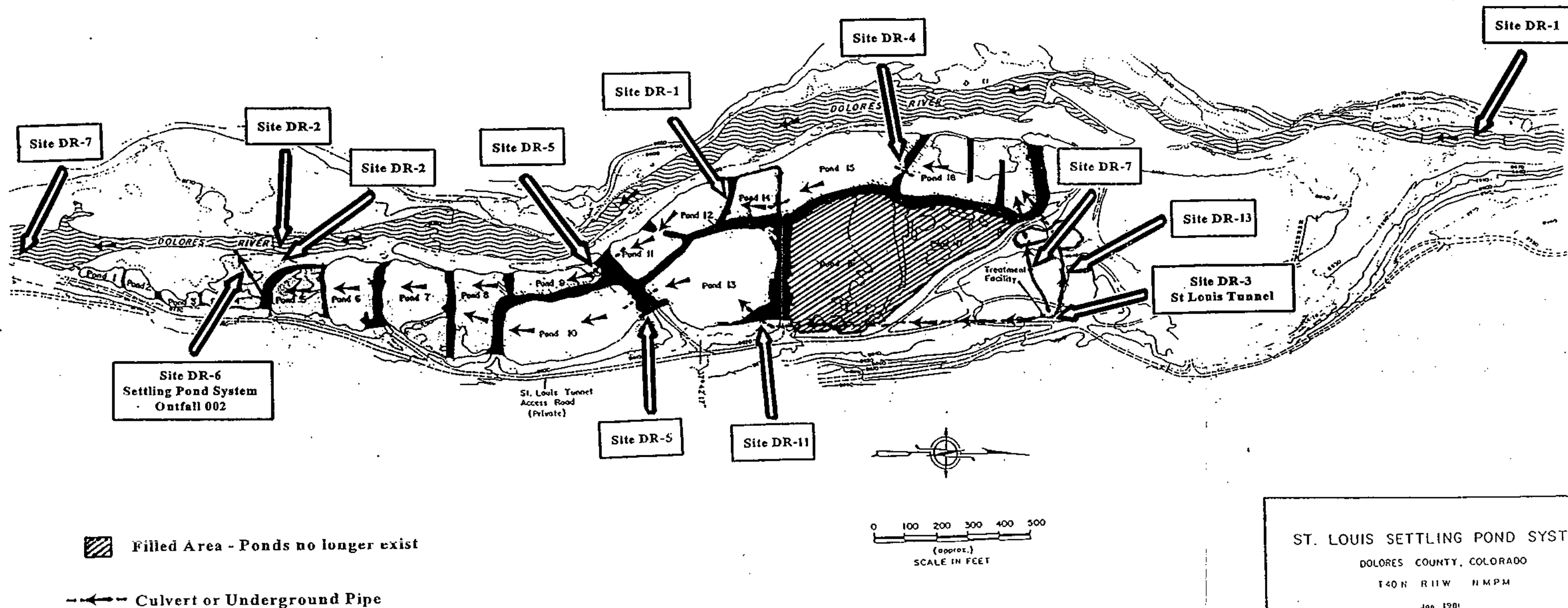
DR-7 (57.7 cfs). Site DR-7 (57.7 cfs) was measured first beginning at approximately 9 am on June 27, 2000, followed by Site DR-2 (47.4 cfs) beginning at 9:45 am, and lastly DR-1 (40.1 cfs) was measured beginning at 10:40 am. The USGS Station (# 09165000), which is approximately 4 miles downstream of Rico, recorded 70 cfs during the period that DR-1, and DR-2 were measured. However, the USGS provisional gage data indicates a flow decrease close to the time DR-1 was being measured. Therefore, the river flows were likely decreasing as the flow measurements were conducted and contributed to the flow difference in the measurements. Other factors contributing the measured flow increase between DR-1 and DR-7 include: 1.5 to 2 cfs inflow from the St. Louis tunnel discharge, potential inflow from Aztec Gulch, potential groundwater inflow, and potential discharge measurement error.

St. Louis Settling Pond System. Flows in the St. Louis Settling Pond System were measured on June 26, 2000, beginning measurements at the downstream end and proceeding upstream to the St. Louis tunnel adit. Flows were measured at several locations.

Two Geothermal Springs were inspected during the site visit. The Geothermal Spring located in the north east corner of Pond 6 was essentially inactive and, upon visual observation, was not contributing flows to Pond 6. The other Geothermal Spring is located in the north west corner of Pond 5. The flows from this Geothermal Spring have been routed through a conduit to a Hot Tub located near the Dolores River (Figure 6). The flow from the spring was measured at approximately 12 gallons per minute.



Silver Creek Basin
Site Location Map
Figure 1



ST. LOUIS SETTLING POND SYSTEM
 DOLORES COUNTY, COLORADO
 T40N R11W NMPM
 Jan 1981

Figure 2

Color Photo(s)

The following pages
contain color that does
not appear in the
scanned images.

To view the actual images, please
contact the Superfund Records
Center at (303) 312-6473.



Figure 3. Blaine Adit Discharge into Silver Creek (Site SC-2). The discharge was measured at approximately 1.6 gallons per minute.



Figure 4. St. Louis tunnel Discharge at Adit (Site DR-3). Flow from the tunnel is conveyed to the Pond System via three separate routes.

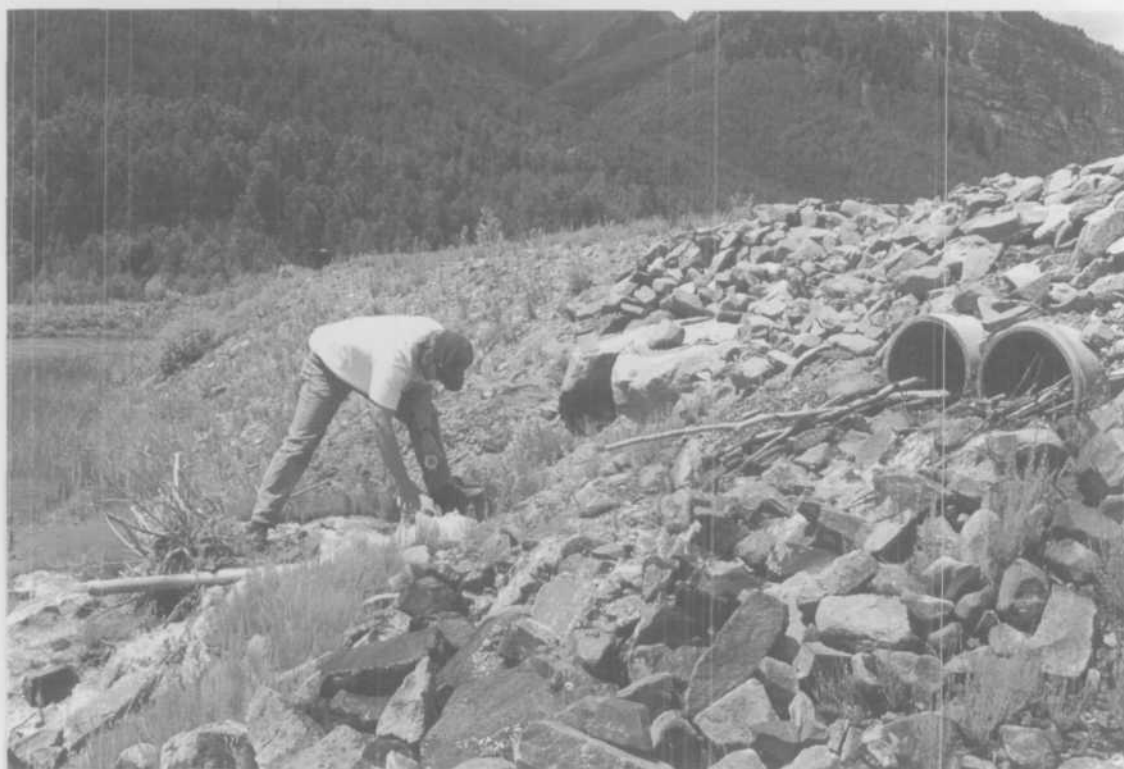


Figure 5. St. Louis settling Pond 18 Discharge (Site DR-4). Two additional culverts and a rock overflow spillway have recently been installed at the Pond 18 discharge.



Figure 6. Geothermal Springs Discharge to Dolores River (Site DR-8). Flow has been routed from the Spring to a Hot Tub; from which it flows into the Dolores River.



Figure 7. St. Louis Tunnel Settling Pond System Outfall 002 (Site DR-6). Sampling location just below end of concrete channel.



Figure 8. St. Louis Tunnel Discharge at Adit (Site DR-3) - Discharge Measurement. Flow measured by Marsh-McBirney Model 2000 flow meter.



Figure 9. St. Louis Tunnel Overland Discharge to Pond 18 (Site DR-12) - Discharge Measurement. The Overland flow discharges into Pond 18.



Figure 10. St. Louis Tunnel Settling Pond System Outfall 002 (Site DR-6) - Discharge Measurement.

APPENDIX A

Field Records

APPENDIX A1

Field Notes

JUNE 26, 2000

Steve Story

Bill Schenderlein

ST. Louis Ponds:

0915

DR-6 Settling Pond System Outfall

Air temp 56°F - overcast

Equipment Calibration:

pH = Buffer 1 = 7.0

Buffer 2 = 10.0

std 1 = 7.02

std 2 = 9.95

Test w/ Buffer 1 - pH = 7.04

DR-6 Samples:

pH = 6.77 @ 15.1 °C

Cond = 1149 μ S @ 15 °C

Alk = 107 mg/L as CaCO₃

Samples:

- Hard, TSS, TDS

Tag # 102

- Diss Metals (HNO₃)

Tag # 101 (Filtered)

- TR Metals (HNO₃)

Tag # 100

Preservative \rightarrow

DR-8 Samples - Geothermal Spring

@ 1005

- pH = 6.53 @ 40.2 °C

- Cond = 2846 μ S @ 36.6 °C

- Alk = 1180 mg/L as CaCO₃

- Samples =

Tag #

- Hard, TSS, TDS:

105

- Diss Metals:

104

- TR Metals:

103

Note: Samples collected from
conduit discharge @ Hot Tub.

Geothermal Spring Flow measurement:

Measurement	volume	time
#1	3.2 gal	17.04 sec
#2	3.1 gal	15.36 sec
#3	3.1 gal	15.34 sec
#4	3.3 gal	16.56 sec

0.0326

W. 0.4 / 3.7 / 0.39, 0.30, 0.35

1035 DR-6 (D. River Outfall)

Flow Measurement along
concrete Lined Channel:

Channel = 4' wide

	Depth (ft)	$D \cdot s^2$ (ft)	Flow ² (ft ² /s)
1.	0.4	0.1	0.66, 0.63, 0.69
2.	0.4	0.4	0.68, 0.68, 0.64
3.	0.4	0.8	0.69, 0.70, 0.64
4.	0.4	1.2	0.69, 0.63, 0.68
5.	0.4	1.6	0.75, 0.72, 0.82
6.	0.4	2.0	0.84, 0.72, 0.79
7.	0.4	2.4	0.78, 0.70, 0.73
8.	0.4	2.8	0.61, 0.63, 0.65
9.	0.4	3.2	0.37, 0.40, 0.46
10.	0.4	3.6	0.38, 0.34, 0.34

1. Readings taken every 4/10's^{ft}.

2. 10 sec. average, 3 readings
per/sta.
Measured from Lt to Rt as
facing upstream.

1130 @ STA. DR-5: Pond 11.
discharge

• PH = 6.96 @ 15.2°C
• Cond = 1088 μ S @ 15.2°C
• ALK = 66 mg/L as CaCO₃.
• Samples: Tag #
• Hard., TDS, TSS 108
• Diss. Metals 107
• TR. Metals 106

1200 DR-5 Flow Measurement:
Pond 11 discharge

Depth Dist. Flow
(ft) (ft) (g/s)

1/10/07

start at

1.	0	3.9	0.0
2.	0.2	4.1	0.0
3.	0.4	4.3	0.03, 0.03, 0.04
4.	0.45	4.5	0.42, 0.39, 0.42
5.	0.50	4.7	0.80, 0.82, 0.92, 0.96
6.	0.50	4.9	1.82, 1.83, 1.91
7.	0.50	5.1	1.60, 1.57, 1.58
8.	0.55	5.3	1.72, 1.71, 1.78
9.	0.50	5.5	2.01, 1.97, 1.97
10.	0.45	5.7	1.35, 1.34, 1.25
11.	0.45	5.9	0.98, 0.84, 0.87, 0.86
12.	0.45	6.1	0.15, 0.15, 0.13
13.	0	6.4	0

Channel width \approx 2.3'

1230 Pond 13 Discharge - by
5 gal. bucket

Measurement	Volume	Time
#1	4.75 gal.	23.71
#2	4.75 gal.	24.21
#3	4.75 gal.	27.24
		0.03 (s)

1240 Pond 13 discharge sampling:

- PH = 6.81 @ 16.2 °C
- Cond = 1236 μ S @ 15.3 °C
- Alk = 51 mg/L as CaCO_3
- Samples = Tag #
- Hard, TDS, TSS 111
- Diss Metals 110
- TR Metals 109

1350 POND 13 INFLOW (From
St. Louis Tunnel):

- Measured pipe by
5 gal. bucket

Measurement	VOL	Time
#1	4.75 gal	3.34
#2	4.75 gal	3.31
#3	4.75 gal	3.34
		0.19 of 5

1415 STA. DR-4 Sampling:
- POND 18 Discharge

• PH = 6.88 @ 18.2°C
• COND = 1072 μ S @ 18.2°C
• ALK = 86 mg/L as CaCO_3
• Samples = Tag #
- Hard, TDS, TSS 114
- DISS Metals 113
- TR Metals 112

1445 STA. DR-3: ST. Louis Tunnel
discharge @ Adit:

• PH = 6.58 @ 16.1°C
• COND = 1065 @ 19.4°C
• ALK = 67 mg/L as CaCO_3
• Samples: TAG #
- Hard, TDS, TSS 117
- DISS Metals 116
- TR Metals 115

1510 STA. DR-3 - Flow measurement
ST. LOUIS TUNNEL @ Adit.

	Depth	Distance	Flow
1	0	4.0	0
2	0.9	4.1	-0.02, -0.01, -0.01
3	0.9	4.5	0.05, 0.06, 0.06
4	0.8	5.0	0.17, 0.18, 0.19
5	0.9	5.5	0.16, 0.13, 0.19
6	0.65	6.0	0.46, 0.48, 0.46
7	0.95	6.5	0.44, 0.48, 0.49
8	0.95	7.0	0.49, 0.49, 0.47
9	1.00	7.5	0.42, 0.46, 0.48
10	0.8	8.0	0.51, 0.48, 0.38, 0.46
11	1.05	8.5	0.36, 0.35, 0.35
12	1.0	9.0	0.20, 0.21, 0.23
13	0.95	9.5	0.00, 0.02, -0.05
14	0.85	10	-0.15, -0.14, -0.17
15	0	10.3	0

1545 Flow Measurement - Diversion
to POND ~~78~~¹⁸ Via CONCRETE
channel + Ditch. Flow
from St. Louis Adit:

Depth	Dist	Flow
0	6" ⁵⁰	0
1. 0.25	8" ⁵²	-0.11, 0.09, 0.14
2. 0.3	10" ⁸³	0.22, 0.13, 0.23, 0.12, 0.25
3 0.3	12" ¹⁰⁰	0.70, 0.69, 0.69
4. 0.35	14" ¹¹⁷	0.70, 0.84, 0.75
5. 0.35	16" ¹³³	0.49, 0.59, 0.66, 0.63
6. 0.4	18" ¹⁵⁰	0.84, 0.43, 0.77, 0.79, 0.72
7. 0.5	20" ¹⁶⁷	1.36, 1.37, 1.50, 1.51, 1.51
8. 0.6	22" ¹⁸³	1.83, 1.71, 1.84
9. 0.5	24" ²⁰⁰	1.44, 1.50, 1.48
10. 0.4	26" ²¹⁷	0.78, 0.83, 0.80
11. 0.35	28" ²³³	0.35, 0.31, 0.34
12. 0	31" ²⁵⁰	0

1610 Flow Measurement - Diversion
to ~~POND~~ POND ~~78~~¹⁸ Via Overland
Flow. Flow from St. Louis
Adit

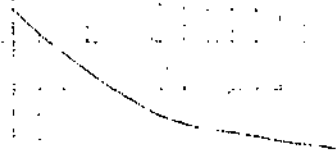
Depth	Dist	Flow
0	6" ⁵⁰	0
1. 0.3	7" ⁵⁸	2.61, 2.57, 2.55
2. 0.3	8" ⁵⁷	3.07, 3.07, 3.11
3. 0.3	10" ⁸³	3.84, 3.85, 3.42
4. 0.4	12" ¹⁰⁰	3.19, 3.40, 3.47
5. 0.35	14" ¹¹⁷	2.82, 2.91, 2.85
6. 0.3	16" ¹³³	2.46, 2.94, 2.98
7. 0.35	18" ¹⁵⁰	1.97, 2.03, 1.91
8. 0.35	19" ¹⁵⁸	1.65, 1.60, 1.58
9. 10	22" ¹⁸³	0

1650 Flow Observation - POND 10
Outlet: Flows go overbank
(not through culvert) - Visual
estimate 15-20 gpm

outflow
V

1715 POND 14 Discharge Measurement
- Flows over the top of
Dike through a cut
channel:

	Depth	Dist.	Flow
	0	4.0	0
1.	0.5 0.5	4.2	0.69, 0.72, 0.68
2.	0.7	4.4	1.62, 1.59, 1.53
3.	0.7	4.6	1.36, 1.38, 1.45
4.	0.8	4.8	1.03, 0.93, 0.97
5.	0.8	5.0	0.77, 0.89, 0.96, 0.88
6.	0.8	5.2	0.68, 0.70, 0.70
7.	0.7	5.4	0.53, 0.56, 0.57
8.	0.7	5.6	0.48, 0.48, 0.45
9.	0.6	5.8	0.42, 0.40, 0.44
10.	0.6	6.0	0.39, 0.40, 0.40
11.	0.6	6.2	0.30, 0.32, 0.30
12.	0.55	6.4	0.18, 0.18, 0.17
13.	0.45	6.6	0.16, 0.15, 0.13
14.	0.4	6.8	0.11, 0.14, 0.16
15.	0	7.1	0



JUNE 27, 2000, TUESDAY

S. Story

B. Schenderlein

DOLORES RIVER SAMPLING AND
FLOW MEASUREMENT

0825 PH Meter Calibration:

Buffer 1 = 7.0

Buffer 2 = 10.0

STD. 1 = 7.04

STD. 2 = 10.10

Test w/ Buffer 1: PH = 7.04

0825 STA. DR-7: Dolores R. below
St. Louis Pond system outfall

PH = 4.83 @ 8.6 °C

COND = 295.8 μ S @ 8.9 °C

ALK = 62 mg/L as CaCO₃

Samples: Tag #

- Hard, TDS, TSS 118

- DISS METALS 119

- DUP (Hard, TDS, TSS) 120

- DUP (DISS Metals) 121

0855 Flow Measurement @ DR-7

	Depth	Dist	Flow
1.	0	5.8	0
2.	0.35	6.0	1.20, 1.23, 1.22
3.	0.45	8.5	1.84, 1.82, 1.81
4.	0.65	11.0	2.34, 2.33, 2.25
5.	0.60	13.5	1.56, 1.61, 1.42, 1.63
6.	1.00	16.0	1.06, 1.10, 1.08
7.	0.65	18.5	2.16, 2.16, 2.35, 2.18
8.	0.80	21.0	1.90, 1.94, 1.86
9.	0.70	23.5	1.43, 1.45, 1.52, 1.46
10.	1.05	26.0	1.57, 1.62, 1.53
11.	0.95	28.5	1.40, 1.38, 1.38
12.	0.85	31.0	2.62, 2.82, 2.67, 2.64
13.	1.60	33.5	2.55, 2.65, 2.76, 2.69
14.	1.75	36.0	2.24, 2.36, 2.34, 2.25
15.	0	37.1	0
16.			

* Measured left to right as
facing upstream (same method
as yesterday)

1125 Checked PH & COND @ DR-7

PH = 7.16

COND = 287 @ 10.7 °C

0925 STA. DR-2 : Dolores R. above
POND system outfall:

• PH = 7.23 @ 9.6 °C
• COND = 282.5 @ 10.3 °C
• AIK = 112 mg/L as CaCO₃
• Samples: Tag #
- Hard, TDS, TSS 122
- DISS Metals 123

* NOTE: Sampling location moved
upstream approx. 100' (from
last Nov. sample) to accommodate
streamflow measurements.

0945 Flow Measurement @ DR-2

	Depth	Dist	Flow
1	0	5.5	0
2	1.4	8.5	0.34, 0.41, 0.38
3	1.4	9.0	0.0, -0.09, -0.08
4	1.6	11.5	1.53, 1.71, 1.80, 1.83
5	1.45	14.0	1.31, 1.45, 1.41
6	1.25	16.5	0.71, 0.62, 0.57, 0.65
7	1.60	19.0	1.65, 1.42, 1.77, 1.64
8	1.40	21.5	1.74, 1.83, 1.69
9	1.55	24.0	1.42, 1.41, 1.42
10	1.60	26.5	1.64, 1.44, 1.52, 1.57
11	1.45	29.0	1.06, 1.08, 1.14
12	1.20	31.5	0.94, 0.76, 0.96, 0.97
13	1.10	34.0	0.54, 0.51, 0.53
14	0.50	36.5	0.65, 0.64, 0.63
15	0	38	0

1015 STA. DR-1: Dolores R. above

POND system:

- PH = 7.42 @ 9.7°C
- COND = 191 μ S @ 9.9°C
- ALK = 62 mg/L as CaCO_3
- Samples = Tag #
- Hard, TDS, TSS 124
- DISS Metals 125

1040 Flow Measurements @ DR-1

	Depth	DIST	Flow
1	0	6.0	0
2	0.45	7.0	1.73, 1.71, 1.80
3	1.00	9.5	1.15, 1.24, 1.28, 1.21
4	1.25	12.0	2.24, 2.29, 2.33
5	1.25	14.5	0.68, 0.64, 0.80, 0.75
6	1.30	17.0	1.53, 1.46, 1.42
7	1.30	19.5	1.64, 1.64, 1.67
8	1.55	22.0	1.42, 1.56, 1.52
9	1.65	24.5	1.03, 1.10, 0.96
10	1.40	27.0	1.11, 1.07, 1.13
11	0.40	29.5	1.16, 1.28, 1.11, 1.17
12	0.65	32.0	0.83, 0.88, 0.87
13	0.20	33.5	0.68, 0.70, 0.63
14	0	34.2	0
15			

10

SILVER CREEK / BLAINE ADIT

SAMPLING + FLOW MEASUREMENT

13:00 Flow measurement @ SC-3

1240 STA. SC-3 : Silver Creek
below Blaine Adit discharge:

* BLANKS:

TAG

- Hard, TDS, TSS

126

- DISS Metals

127

- TR Metals

128

• PH = 6.32 @ 10.1°C

• COND = 185 μ S @ 10.4°C• ALK = 78 mg/L as CaCO₃

• Samples:

TAG

- HARD, TDS, TSS

129

- DISS Metals

130

* PH Check buffer T = 6.96 @ 19.6°C

	Depth	Distance	Flow
1.	0	5.7	0
2.	0.3	6.5	0.22, 0.27, 0.18
3.	0.4	7.0	0.35, 0.32, 0.35
4.	0.4	7.5	0.93, 0.97, 0.87, 0.85
5.	0.45	8.0	1.27, 1.24, 1.27
6.	1.0.5	8.5	0.60, 0.67, 0.62
7.	0.5	9.0	1.08, 1.12, 1.22, 1.22
8.	0.45	9.5	0.53, 0.55, 0.53
9.	0.5	10.0	1.56, 1.53, 1.49
10.	0.3	10.5	0.78, 0.77, 0.76
11.	0.5	11.0	0.89, 0.92, 0.94
12.	0.4	11.5	1.12, 1.08, 1.04
13.	0.4	12.0	0.80, 0.88, 0.93
14.	0.45	12.5	0.21, 0.27, 0.23
15.	0.2	13.0	0.96, 0.84, 0.83
16.	0.3	13.5	0.59, 0.61, 0.56
17.	0.2	14.0	0.40, 0.41, 0.40
18.	0.2	14.5	0.51, 0.54, 0.54
19.	0.1	15.0	0.10, 0.10, 0.11
20.	0	15.03	0

Looking upstream measurement,

went R to L.

13:30 Flow measurement at SC-1

	Depth	Distance	Flow
1.	0	4.9	0
2.	0.3	5.5	-0.40, -0.34, -0.40
3.	0.3	6.0	-0.14, -0.11, -0.21
4.	0.4	6.5	0.18, 0.17, 0.32, 0.19
5.	0.8	7.0	0.22, 0.11, 0.26, 0.15
6.	0.7	7.5	0.80, 0.79, 0.59, 0.58
7.	0.9	8.0	0.63, 0.73, 0.49
8.	0.9	8.5	1.08, 0.99, 1.08
9.	0.9	9.0	1.62, 1.58, 1.66
10.	0.7	9.5	1.03, 1.01, 1.15, 1.04
11.	0.9	10.0	0.11, 0.07, 0.07
12.	0.8	10.5	-0.16, -0.17, -0.18
13.	0.5	11.0	-0.28, -0.26, -0.20
14.	0.6	11.5	0.81, 0.86, 0.77
15.	0.3	12.0	0.67, 0.63, 0.56
16.	0	12.5	0

13:50 STA. SC-1: Silver Creek
above Blaine Adit Discharge:

- PH = 7.41 @ 10.2 °C
- COND = 174.5 μ S @ 10.5 °C
- ALK = 75 mg/L as CaCO₃
- Samples: TAG #
- HARD, TDS, TSS 131
- DISS METALS 132

14:05 STA. SC-2: Blaine Adit
discharge immediately prior to
entering Silver Creek:

- PH = 1.97 @ 8 °C
- COND = 8720 μ S @ 8.4 °C
- ALK = N/A
- Samples: TAG #
- HARD, TDS, TSS 133
- DISS METALS 134

Flow measurement @ SC-2
by 5-gallon bucket

Measurement	Volume	Time
#1	3.0 gal	1:54.09
#2	3.0 gal	1:55.60
#3	3.05 gal	1:58.27

15:00

APPENDIX A2

Field Sampling and Stream Flow Measurement Forms



SURFACE WATER SAMPLING FORM

Station ID: Feild Blank

Project Name: RICO

Location: _____

Date: 6/27/00 Time: 12:40

Weather Conditions: P. Cloudy, Windy, warm (70°F)

Sampling Personnel (Signature): [Signature]

FIELD MEASUREMENTS

pH/Temp: _____ Dissolved Oxygen/Temp (mg/L): _____

Specific Conductance/Temp ($\mu\text{S}/\text{cm}$): _____

Fe (II) (mg/L): _____ Fe (total)(mg/L): _____

Alkalinity (mg/L as CaCO₃): _____ Calculated Streamflow (cfs): _____

COMMENTS: _____

WATER QUALITY SAMPLES

Tag No.	Date/Time	Preserved	Analysis
126	6/27 12:40	—	Hand, TOS, TSS
127	6/27 12:40	HNO ₃	Diss. metals (Cd, Cu, Fe, Pb, Mn, Ag, Zn)
128	6/27 12:40	HNO ₃	TR metals "

Site Sketch:



ESA CONSULTANTS INC.
2637 Midpoint Drive, Suite F
Fort Collins, Colorado 80525
(970) 484-3611 (970) 484-4118 FAX

SURFACE WATER SAMPLING FORM

Station ID: SC-1 Project Name: RICO

Location: Silver Creek above Blaine Tunnel drainage

Date: 6/27/00 Time: 13:50

Weather Conditions: P. cloudy, Windy, Warm (70°F)

Sampling Personnel (Signature): [Signature]

FIELD MEASUREMENTS

pH/Temp: 7.41 @ 10.2°C Dissolved Oxygen/Temp (mg/L):

Specific Conductance/Temp (µS/cm): 174.5 compensated to 25°C

Fe (II) (mg/L): Fe (total)(mg/L):

Alkalinity (mg/L as CaCO₃): 75 Calculated Streamflow (cfs):

COMMENTS:

WATER QUALITY SAMPLES

Tag No.	Date/Time	Preserved	Analysis
<u>131</u>	<u>6/27 13:50</u>	<u>—</u>	<u>Hard, TDS, TSS</u>
<u>132</u>	<u>6/27 13:50</u>	<u>HNO₃</u>	<u>Diss. metals (Cd, Cu, Fe, Pb, Mn, Ag, Zn)</u>

Site Sketch:



ESA CONSULTANTS INC.
2637 Midpoint Drive, Suite F
Fort Collins, Colorado 80525
(970) 484-3611 (970) 484-4118 FAX

SURFACE WATER SAMPLING FORM

Station ID: SC-2 Project Name: RICO

Location: Blaine Tunnel drainage

Date: 6/27/00 Time: 14:05

Weather Conditions: P. Cloudy, Windy, Warm (70°F)

Sampling Personnel (Signature): [Signature]

FIELD MEASUREMENTS

pH/Temp: 1.97 @ 8°C Dissolved Oxygen/Temp (mg/L):

Specific Conductance/Temp ($\mu\text{S}/\text{cm}$): 8720 compensated to 25°C

Fe (II) (mg/L): Fe (total)(mg/L):

Alkalinity (mg/L as CaCO_3): N/A Calculated Streamflow (cfs):

COMMENTS:

WATER QUALITY SAMPLES

Tag No.	Date/Time	Preserved	Analysis
<u>133</u>	<u>6/27 14:05</u>	<u> </u>	<u>Hard, TDS, TSS</u>
<u>134</u>	<u>6/27 14:05</u>	<u>HNO₃</u>	<u>Diss. metals (Cd, Cu, Fe, Pb, Mn, Ag, Zn)</u>

Site Sketch:



ESA CONSULTANTS INC.
2637 Midpoint Drive, Suite F
Fort Collins, Colorado 80525
(970) 484-3611 (970) 484-4118 FAX

SURFACE WATER SAMPLING FORM

Station ID: SC-3 Project Name: RICO

Location: Silver Creek below Blaine Tunnel drainage

Date: 6/27/00 Time: 12:40

Weather Conditions: P. Cloudy, Windy, Warm (70°F)

Sampling Personnel (Signature): [Signature]

FIELD MEASUREMENTS

pH/Temp: 6.32 @ 10.1°C Dissolved Oxygen/Temp (mg/L): —

Specific Conductance/Temp ($\mu\text{S}/\text{cm}$): 185 compensated to 25°C

Fe (II) (mg/L): — Fe (total)(mg/L): —

Alkalinity (mg/L as CaCO_3): 78 Calculated Streamflow (cfs): —

COMMENTS: —

WATER QUALITY SAMPLES

Tag No.	Date/Time	Preserved	Analysis
<u>129</u>	<u>6/27 1240</u>	<u>—</u>	<u>Hard, TDS, TSS</u>
<u>130</u>	<u>6/27 1240</u>	<u>HNO₃</u>	<u>Diss. metals (Cd, Cu, Fe, Pb, Mn, Ag, Zn)</u>

Site Sketch:



ESA CONSULTANTS INC.
2637 Midpoint Drive, Suite F
Fort Collins, Colorado 80525
(970) 484-3611 (970) 484-4118 FAX

SURFACE WATER SAMPLING FORM

Station ID: DR-1 Project Name: RICO

Location: Dolores River above St. Louis Pond system

Date: 6/27/2000 Time: 10:15

Weather Conditions: Sunny, Lt. breeze, warm (65°F)

Sampling Personnel (Signature): [Signature]

FIELD MEASUREMENTS

pH/Temp: 7.42 @ 9.7°C Dissolved Oxygen/Temp (mg/L):

Specific Conductance/Temp ($\mu\text{S}/\text{cm}$): 191 compensated to 25°C

Fe (II) (mg/L): Fe (total)(mg/L):

Alkalinity (mg/L as CaCO_3): 62 Calculated Streamflow (cfs):

COMMENTS:

WATER QUALITY SAMPLES

Tag No.	Date/Time	Preserved	Analysis
<u>124</u>	<u>6/27 10:15</u>	<u> </u>	<u>Hand, TDS, TSS</u>
<u>125</u>	<u>6/27 10:15</u>	<u>HNO₃</u>	<u>Diss. metals (Cd, Cu, Fe, Pb, Mn, Ag, Zn)</u>

Site Sketch:



ESA CONSULTANTS INC.
2637 Midpoint Drive, Suite F
Fort Collins, Colorado 80525
(970) 484-3611 (970) 484-4118 FAX

SURFACE WATER SAMPLING FORM

Station ID: DR-2 Project Name: RICO

Location: Dolores River upstream of St. Louis Pond system discharge 002

Date: 6/27/00 Time: 9:25

Weather Conditions: Sunny, Lt. breeze, cool (60°F)

Sampling Personnel (Signature): [Signature]

FIELD MEASUREMENTS

pH/Temp: 7.23 @ 9.6°C Dissolved Oxygen/Temp (mg/L): —

Specific Conductance/Temp ($\mu\text{S}/\text{cm}$): 232.5 compensated to 25°C

Fe (II) (mg/L): — Fe (total)(mg/L): —

Alkalinity (mg/L as CaCO_3): 112 Calculated Streamflow (cfs): —

COMMENTS: —

WATER QUALITY SAMPLES

Tag No.	Date/Time	Preserved	Analysis
<u>122</u>	<u>6/27 9:25</u>	<u>—</u>	<u>Hard, TDS, TSS</u>
<u>123</u>	<u>6/27 9:25</u>	<u>HNO₃</u>	<u>Diss. metals (Cd, Cu, Fe, Pb, Mn, Ag, Zn)</u>

Site Sketch:



ESA CONSULTANTS INC.
2637 Midpoint Drive, Suite F
Fort Collins, Colorado 80525
(970) 484-3611 (970) 484-4118 FAX

SURFACE WATER SAMPLING FORM

Station ID: DR-3 Project Name: RICO

Location: St. Louis Tunnel - discharge

Date: 06/26/2000 Time: 14:45

Weather Conditions: Sunny, (72°F)

Sampling Personnel (Signature): [Signature]

FIELD MEASUREMENTS

pH/Temp: 6.58 @ 16.1°C Dissolved Oxygen/Temp (mg/L):

Specific Conductance/Temp (μ S/cm): 1065 compensated to 25°C

Fe (II) (mg/L): Fe (total)(mg/L):

Alkalinity (mg/L as CaCO₃): 67 Calculated Streamflow (cfs):

COMMENTS:

WATER QUALITY SAMPLES

Tag No.	Date/Time	Preserved	Analysis
<u>115</u>	<u>6/26 14:45</u>	<u>HNO₃</u>	<u>TR metals (Cd, Cu, Fe, Pb, Mn, Ag, Zn)</u>
<u>116</u>	<u>6/26 14:45</u>	<u>HNO₃</u>	<u>Diss. metals</u>
<u>117</u>	<u>6/26 14:45</u>	<u> </u>	<u>Hard, TDS, TSS</u>

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SURFACE WATER SAMPLING FORM

Station ID: DR-4 Project Name: RICO

Location: St. Louis Pond 1B - discharge

Date: 06/26/2000 Time: 14:15

Weather Conditions: Sunny, (72° F)

Sampling Personnel (Signature): [Signature]

FIELD MEASUREMENTS

pH/Temp: 6.88 @ 18.2°C Dissolved Oxygen/Temp (mg/L):

Specific Conductance/Temp ($\mu\text{S}/\text{cm}$): 1072 compensated to 25°C

Fe (II) (mg/L): Fe (total)(mg/L):

Alkalinity (mg/L as CaCO_3): 86 Calculated Streamflow (cfs):

COMMENTS:

WATER QUALITY SAMPLES

Tag No.	Date/Time	Preserved	Analysis
<u>112</u>	<u>6/26 14:15</u>	<u>HNO_3</u>	<u>TR metals (Cd, Cu, Fe, Pb, Mn, Ag, Zn)</u>
<u>113</u>	<u>6/26 14:15</u>	<u>HNO_3</u>	<u>Diss. metals "</u>
<u>114</u>	<u>6/26 14:15</u>	<u> </u>	<u>Hard, TDS, TSS</u>

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SURFACE WATER SAMPLING FORM

Station ID: DR-5 Project Name: RICO

Location: St. Louis Pond 11 discharge

Date: 06/26/2000 Time: 11:30

Weather Conditions: Sunny (68°F)

Sampling Personnel (Signature): [Signature]

FIELD MEASUREMENTS

pH/Temp: 6.96 @ 15.2°C Dissolved Oxygen/Temp (mg/L):

Specific Conductance/Temp ($\mu\text{S}/\text{cm}$): 1088 compensated to 25°C

Fe (II) (mg/L): Fe (total)(mg/L):

Alkalinity (mg/L as CaCO_3): 66 Calculated Streamflow (cfs):

COMMENTS:

WATER QUALITY SAMPLES

Tag No.	Date/Time	Preserved	Analysis
<u>106</u>	<u>6/26 11:30</u>	<u>HNO₃</u>	<u>TRmetals (Cd, Cu, Fe, Pb, Mn, Ag, Zn)</u>
<u>107</u>	<u>6/26 11:30</u>	<u>HNO₃</u>	<u>Diss. metals "</u>
<u>108</u>	<u>6/26 11:30</u>	<u>-</u>	<u>Hard, TSS, TDS</u>

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SURFACE WATER SAMPLING FORM

Station ID: DR-6 Project Name: Rico

Location: St. Louis Pond System

Date: 06/26/2000 Time: 9:15

Weather Conditions: overcast (56°F)

Sampling Personnel (Signature): [Signature]

FIELD MEASUREMENTS

pH/Temp: 6.77 @ 15.1°C Dissolved Oxygen/Temp (mg/L): —

Specific Conductance/Temp ($\mu\text{S}/\text{cm}$): 1149 compensated to 25°C

Fe (II) (mg/L): — Fe (total) (mg/L): —

Alkalinity (mg/L as CaCO_3): 107 Calculated Streamflow (cfs): —

COMMENTS: —

WATER QUALITY SAMPLES

Tag No.	Date/Time	Preserved	Analysis
<u>100</u>	<u>6/26 9:15</u>	<u>HNO_3</u>	<u>TR metals (Cd, Cu, Fe, Pb, Mn, Ag, Zn)</u>
<u>101</u>	<u>6/26 9:15</u>	<u>HNO_3</u>	<u>Diss. metals "</u>
<u>102</u>	<u>6/26 9:15</u>	<u>—</u>	<u>Hard, TSS, TDS</u>

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SURFACE WATER SAMPLING FORM

Station ID: DR-7 Project Name: RICO

Location: below St. Louis Pond system outfall

Date: 6/27/00 Time: 8:25

Weather Conditions: P. Cloudy, 62°F, Lt. Breeze

Sampling Personnel (Signature): [Signature]

FIELD MEASUREMENTS

pH/Temp: 6.83 @ 8.6°C Dissolved Oxygen/Temp (mg/L): —

Specific Conductance/Temp ($\mu\text{S}/\text{cm}$): 295.8 compensated to 25°C

Fe (II) (mg/L): — Fe (total)(mg/L): —

Alkalinity (mg/L as CaCO_3): 62 Calculated Streamflow (cfs): —

COMMENTS: —

WATER QUALITY SAMPLES

Tag No.	Date/Time	Preserved	Analysis
<u>118</u>	<u>6/27 8:25</u>	<u>—</u>	<u>Hard, TDS, TSS</u>
<u>119</u>	<u>6/27 8:25</u>	<u>HNO_3</u>	<u>Diss metals (Cd, Cu, Fe, Pb, Mn, Ag, Zn)</u>
<u>120</u>	<u>6/27 8:25</u>	<u>—</u>	<u>Hard, TDS, TSS (Dup)</u>
<u>121</u>	<u>6/27 8:25</u>	<u>HNO_3</u>	<u>Diss. metals (Cd, Cu, Fe, Pb, Mn, Ag, Zn) (Dup)</u>

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SURFACE WATER SAMPLING FORM

Station ID: DR-8 Project Name: RICO

Location: Geothermal Spring

Date: 06/26/2000 Time: 10:05

Weather Conditions: Sunny (65°F)

Sampling Personnel (Signature): [Signature]

FIELD MEASUREMENTS

pH/Temp: 6.53 @ 40.2°C Dissolved Oxygen/Temp (mg/L):

Specific Conductance/Temp ($\mu\text{S}/\text{cm}$): 2846 compensated to 25°C

Fe (II) (mg/L): Fe (total)(mg/L):

Alkalinity (mg/L as CaCO_3): 1180 Calculated Streamflow (cfs):

COMMENTS:

WATER QUALITY SAMPLES

Tag No.	Date/Time	Preserved	Analysis
<u>103</u>	<u>6/26 10:05</u>	<u>HNO_3</u>	<u>TR metals (Cd, Cu, Fe, Pb, Mn, Ag, Zn)</u>
<u>104</u>	<u>6/26 10:05</u>	<u>HNO_3</u>	<u>Diss. metals</u>
<u>105</u>	<u>6/26 10:05</u>	<u> </u>	<u>Hard, TSS, TDS</u>

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SURFACE WATER SAMPLING FORM

Station ID: DR-9 Project Name: RICO

Location: St. Louis Pond 13 discharge

Date: 06/26/2000 Time: 12:40

Weather Conditions: Sunny (71 °F)

Sampling Personnel (Signature): [Signature]

FIELD MEASUREMENTS

pH/Temp: 6.81 @ 16.2°C Dissolved Oxygen/Temp (mg/L):

Specific Conductance/Temp ($\mu\text{S}/\text{cm}$): 1236 compensated to 25°C

Fe (II) (mg/L): Fe (total)(mg/L):

Alkalinity (mg/L as CaCO_3): 51 Calculated Streamflow (cfs):

COMMENTS:

WATER QUALITY SAMPLES

Tag No.	Date/Time	Preserved	Analysis
<u>109</u>	<u>6/26 12:40</u>	<u>HNO_3</u>	<u>TR metals (Cd, Cu, Fe, Pb, Mn, Ag, Zn)</u>
<u>110</u>	<u>6/26 12:40</u>	<u>HNO_3</u>	<u>Diss. metals</u>
<u>111</u>	<u>6/26 12:40</u>	<u> </u>	<u>Hard, TDS, TSS</u>

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**FIELD DATA SHEET
STREAM FLOW MEASUREMENT**Station Number: SC-1Project Name: RICODate: 6/27/00Time: 1330Sampling Personnel: (signature) [Signature]Description: Silver Creek above Blaine adit discharge

Vertical Number	Distance (ft/m)	Depth (ft/m)	Velocity (ft/s, m/s)	Segment Flow (ft ³ /s, m ³ /s)
1.	0.00	0.00	0.00	0.00
2.	0.60	0.30	0.00	0.00
3.	0.50	0.30	0.00	0.00
4.	0.50	0.40	0.22	0.04
5.	0.50	0.80	0.19	0.08
6.	0.50	0.70	0.69	0.24
7.	0.50	0.90	0.62	0.28
8.	0.50	0.90	1.05	0.47
9.	0.50	0.90	1.62	0.73
10.	0.50	0.70	1.06	0.37
11.	0.50	0.90	0.08	0.04
12.	0.50	0.80	0.00	0.00
13.	0.50	0.50	0.00	0.00
14.	0.50	0.60	0.83	0.25
15.	0.50	0.30	0.62	0.09
16.	0.50	0.00	0.00	0.00
17.				
18.				
19.				
20.				

Total Flow: 2.59 (cfs)

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**FIELD DATA SHEET
STREAM FLOW MEASUREMENT**Station Number: SC-3Project Name: RICODate: 6/27/00Time: 1300Sampling Personnel: (signature) [Signature]Description: Silver Creek below Blaine adit discharge

Vertical Number	Distance (ft/m)	Depth (ft/m)	Velocity (ft/s, m/s)	Segment Flow (ft ³ /s, m ³ /s)
1.	0.00	0.00	0.00	0.00
2.	0.80	0.30	0.21	0.05
3.	0.50	0.40	0.34	0.07
4.	0.50	0.40	0.88	0.18
5.	0.50	0.45	1.26	0.28
6.	0.50	0.50	0.63	0.16
7.	0.50	0.50	1.16	0.29
8.	0.50	0.45	0.54	0.12
9.	0.50	0.50	1.53	0.38
10.	0.50	0.30	0.77	0.12
11.	0.50	0.50	0.92	0.23
12.	0.50	0.40	1.08	0.22
13.	0.50	0.40	0.87	0.17
14.	0.50	0.45	0.24	0.05
15.	0.50	0.20	0.84	0.08
16.	0.50	0.30	0.59	0.09
17.	0.50	0.20	0.40	0.04
18.	0.50	0.20	0.53	0.05
19.	0.50	0.10	0.10	0.01
20.	0.30	0.00	0.00	0.00

Total Flow: 2.59 (cfs)

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**FIELD DATA SHEET
STREAM FLOW MEASUREMENT**Station Number: DR-1Project Name: RICODate: 6/27/00Time: 1040Sampling Personnel: (signature) [Signature]Description: Dolores River above St. Louis settling pond system.

Vertical Number	Distance (ft/m)	Depth (ft/m)	Velocity (ft/s, m/s)	Segment Flow (ft ³ /s, m ³ /s)
1.	0.00	0.00	0.00	0.00
2.	1.00	0.45	1.75	0.79
3.	2.50	1.00	1.22	3.05
4.	2.50	1.25	2.29	7.16
5.	2.50	1.25	0.92	2.25
6.	2.50	1.30	1.47	4.78
7.	2.50	1.30	1.65	5.36
8.	2.50	1.55	1.50	5.81
9.	2.50	1.65	1.03	4.25
10.	2.50	1.40	1.10	3.85
11.	2.50	0.40	1.18	1.18
12.	2.50	0.65	0.86	1.40
13.	1.50	0.20	0.67	0.20
14.	0.70	0.00	0.00	0.00
15.				
16.				
17.				
18.				
19.				
20.				

Total Flow: 40.08 (cfs)

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**FIELD DATA SHEET
STREAM FLOW MEASUREMENT**Station Number: DR-2Project Name: RICODate: 6/27/00Time: 0945Sampling Personnel: (signature) [Signature]Description: Dolores River above St. Louis settling Pond system outfall.

Vertical Number	Distance (ft/m)	Depth (ft/m)	Velocity (ft/s, m/s)	Segment Flow (ft ³ /s, m ³ /s)
1.	0.00	0.00	0.00	0.00
2.	1.00	0.70	0.38	0.27
3.	2.50	1.40	0.00	0.00
4.	2.50	1.60	1.72	6.88
5.	2.50	1.45	1.39	5.04
6.	2.50	1.25	0.64	2.00
7.	2.50	1.60	1.62	6.48
8.	2.50	1.40	1.75	6.13
9.	2.50	1.55	1.42	5.50
10.	2.50	1.60	1.54	6.16
11.	2.50	1.45	1.09	3.95
12.	2.50	1.20	0.91	2.73
13.	2.50	1.10	0.53	1.46
14.	2.50	0.50	0.64	0.80
15.	1.50	0.00	0.00	0.00
16.				
17.				
18.				
19.				
20.				

Total Flow: 47.40 (cfs)



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FIELD DATA SHEET STREAM FLOW MEASUREMENT

Station Number: DR-3

Project Name: RICO

Date: 6/26/00

Time: 1510

Sampling Personnel: (signature) [Signature]

Description: St. Louis tunnel discharge at adit.

Vertical Number	Distance (ft/m)	Depth (ft/m)	Velocity (ft/s, m/s)	Segment Flow (ft ³ /s, m ³ /s)
1.	0.00	0.00	0.00	0.00
2.	0.10	0.90	0.00	0.00
3.	0.40	0.90	0.06	0.02
4.	0.50	0.80	0.18	0.07
5.	0.50	0.90	0.16	0.07
6.	0.50	0.65	0.46	0.15
7.	0.50	0.95	0.47	0.22
8.	0.50	0.95	0.48	0.23
9.	0.50	1.00	0.45	0.23
10.	0.50	0.80	0.46	0.18
11.	0.50	1.05	0.35	0.18
12.	0.50	1.00	0.21	0.11
13.	0.50	0.95	0.00	0.00
14.	0.50	0.85	0.00	0.00
15.	0.30	0.00	0.00	0.00
16.				
17.				
18.				
19.				
20.				

Total Flow: 1.46 (cfs)

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**FIELD DATA SHEET
STREAM FLOW MEASUREMENT**Station Number: DR-5Project Name: RICODate: 6/26/00Time: 1200Sampling Personnel: (signature) [Signature]Description: Pond 11 Effluent

Vertical Number	Distance (ft/m)	Depth (ft/m)	Velocity (ft/s, m/s)	Segment Flow (ft ³ /s, m ³ /s)
1.	0.00	0.00	0.00	0.00
2.	0.20	0.20	0.00	0.00
3.	0.20	0.40	0.03	0.00
4.	0.20	0.45	0.41	0.04
5.	0.20	0.50	0.86	0.09
6.	0.20	0.50	1.85	0.19
7.	0.20	0.50	1.58	0.16
8.	0.20	0.55	1.74	0.19
9.	0.20	0.50	1.98	0.20
10.	0.20	0.45	1.32	0.12
11.	0.20	0.45	0.89	0.08
12.	0.20	0.45	0.14	0.01
13.	0.30	0.00	0.00	0.00
14.				
15.				
16.				
17.				
18.				
19.				
20.				

Total Flow: 1.08 (cfs)

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**FIELD DATA SHEET
STREAM FLOW MEASUREMENT**Station Number: DR-6Project Name: RICODate: 6/26/00Time: 1035Sampling Personnel: (signature) [Signature]Description: St. Louis settling pond system outfall to Dolores R. (002)

Vertical Number	Distance (ft/m)	Depth (ft/m)	Velocity (ft/s, m/s)	Segment Flow (ft ³ /s, m ³ /s)
1.	0.00	0.00	0.00	0.00
2.	0.10	0.40	0.66	0.03
3.	0.30	0.40	0.67	0.08
4.	0.40	0.40	0.68	0.11
5.	0.40	0.40	0.67	0.11
6.	0.40	0.40	0.76	0.12
7.	0.40	0.40	0.78	0.12
8.	0.40	0.40	0.74	0.12
9.	0.40	0.40	0.63	0.10
10.	0.40	0.40	0.41	0.07
11.	0.40	0.40	0.35	0.06
12.	0.10	0.40	0.35	0.01
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				

Total Flow: 0.93 (cfs)

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**FIELD DATA SHEET
STREAM FLOW MEASUREMENT**Station Number: DR-7Project Name: RICODate: 6/27/00Time: 0855Sampling Personnel: (signature) [Signature]Description: Dolores River below St. Louis settling Pond system outfall.

Vertical Number	Distance (ft/m)	Depth (ft/m)	Velocity (ft/s, m/s)	Segment Flow (ft ³ /s, m ³ /s)
1.	0.00	0.00	0.00	0.00
2.	0.20	0.35	1.22	0.09
3.	2.50	0.45	1.82	2.05
4.	2.50	0.65	2.31	3.75
5.	2.50	0.60	1.56	2.35
6.	2.50	1.00	1.08	2.70
7.	2.50	0.65	2.21	3.59
8.	2.50	0.80	1.90	3.80
9.	2.50	0.70	1.47	2.57
10.	2.50	1.05	1.57	4.12
11.	2.50	0.95	1.39	3.30
12.	2.50	0.85	2.69	5.72
13.	2.50	1.60	2.66	10.64
14.	2.50	1.75	2.30	10.06
15.	1.10	0.00	0.00	0.00
16.				
17.				
18.				
19.				
20.				

Total Flow: 54.74 (cfs)

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**FIELD DATA SHEET
STREAM FLOW MEASUREMENT**Station Number: DR-10Project Name: RICODate: 6/26/00Time: 1715Sampling Personnel: (signature) [Signature]Description: St. Louis settling pond system at pond 14 effluent.

Vertical Number	Distance (ft/m)	Depth (ft/m)	Velocity (ft/s, m/s)	Segment Flow (ft ³ /s, m ³ /s)
1.	0.00	0.00	0.00	0.00
2.	0.20	0.50	0.70	0.07
3.	0.20	0.70	1.58	0.22
4.	0.20	0.70	1.40	0.20
5.	0.20	0.80	0.98	0.16
6.	0.20	0.80	0.88	0.14
7.	0.20	0.80	0.69	0.04
8.	0.20	0.70	0.55	0.03
9.	0.20	0.70	0.47	0.02
10.	0.20	0.60	0.42	0.05
11.	0.20	0.60	0.40	0.05
12.	0.20	0.60	0.31	0.04
13.	0.20	0.55	0.18	0.02
14.	0.20	0.45	0.15	0.01
15.	0.20	0.40	0.14	0.01
16.	0.30	0.00	0.00	0.00
17.				
18.				
19.				
20.				

Total Flow: 1.06 (cfs)

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**FIELD DATA SHEET
STREAM FLOW MEASUREMENT**Station Number: DR-12Project Name: RICODate: 6/26/00Time: 1610Sampling Personnel: (signature) [Signature]Description: St. Louis tunnel Overland flow to Pond 18.

Vertical Number	Distance (ft/m)	Depth (ft/m)	Velocity (ft/s, m/s)	Segment Flow (ft ³ /s, m ³ /s)
1.	0.00	0.00	0.00	0.00
2.	0.08	0.30	2.58	0.06
3.	0.09	0.30	3.08	0.08
4.	0.16	0.30	3.85	0.18
5.	0.17	0.40	3.95	0.27
6.	0.17	0.35	2.83	0.17
7.	0.16	0.30	2.96	0.14
8.	0.17	0.35	1.97	0.12
9.	0.08	0.35	1.61	0.05
10.	0.25	0.00	0.00	0.00
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				

Total Flow: 1.07 (cfs)

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**FIELD DATA SHEET
STREAM FLOW MEASUREMENT**Station Number: DR-13Project Name: RICODate: 6/26/00Time: 1545Sampling Personnel: (signature) [Signature]Description: St. Louis tunnel Channel flow to pond 18.

Vertical Number	Distance (ft/m)	Depth (ft/m)	Velocity (ft/s, m/s)	Segment Flow (ft ³ /s, m ³ /s)
1.	0.00	0.00	0.00	0.00
2.	0.17	0.25	0.00	0.00
3.	0.16	0.30	0.19	0.01
4.	0.17	0.30	0.69	0.04
5.	0.17	0.35	0.76	0.05
6.	0.16	0.35	0.59	0.03
7.	0.17	0.40	0.81	0.06
8.	0.17	0.50	1.45	0.12
9.	0.16	0.60	1.79	0.17
10.	0.17	0.50	1.49	0.13
11.	0.17	0.40	0.80	0.05
12.	0.16	0.35	0.33	0.02
13.	0.25	0.00	0.00	0.00
14.				
15.				
16.				
17.				
18.				
19.				
20.				

Total Flow: 0.68 (cfs)

APPENDIX A3

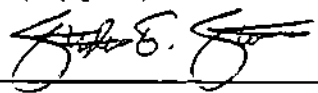
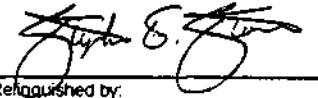
Chain of Custody Forms



Alpine Analytical, Inc.

2814 N. Cooke, Helena, MT 59601

(406) 449-6282

Client ESA Consultants Inc,		Project ID RICO		Analysis Requested				Chain of Custody No 2032								
Sampler (Signature) 		Site ID JUNE 28, 2000		Hard, TSS	Diss Metals	TR Metals										
Sample Identification	Sample		Type		Matrix	Number of Containers	Hard, TSS	Diss Metals	TR Metals			Comments	Turnaround		Sample Disposal	
	Date	Time	grab	Comp									Normal	Rush	Return	Dispose**
TAG #110	6/26	1240	X		SW	1		X				Cd, Cu, Fe, Pb, Mn, Ag, Zn	X			X
TAG # 110 ⁴⁹⁹ 111	6/26	1245	X		SW	1	X						X			X
TAG # 112	6/26	1420	X		SW	1			X			" "	X			X
TAG # 113	6/26	1420	X		SW	1		X				" "	X			X
TAG # 114	6/26	1425	X		SW	1	X						X			X
TAG # 115	6/26	1445	X		SW	1			X			" "	X			X
TAG # 116	6/26	1445	X		SW	1		X				" "	X			X
TAG # 117	6/26	1455	X		SW	1	X						X			X
TAGS # 118, 119 98 ⁶¹²⁷	6/26	0825	X		SW	2	X	X				" "	X			X
TAGS # 120, 121 98 ⁶¹²⁷	6/26	0825	X		SW	2	X	X				" "	X			X
Relinquished by: 		Date/Time 6/28/00		Received by:				Relinquished by:				Date/Time		Received by:		
Relinquished by:		Date/Time		Received by:				Relinquished by:				Date/Time 6/29/00 1350		Received by Laboratory: Theresa Hasfeld		

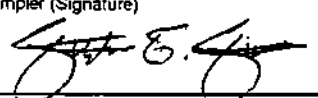
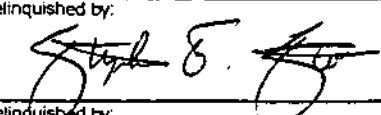

** An additional charge will be made for samples disposed of by Alpine Analytical, Inc. .



Alpine Analytical, Inc.

2814 N. Cooke, Helena, MT 59601

(406) 449-6282

Client ESA Consultants Inc,		Project ID RICO		Analysis Requested				Chain of Custody No 2031							
Sampler (Signature) 		Site ID JUNE 28, 2000		HARD, TDS, TSS	DISS Metals	TR Metals									
Sample Identification	Sample		Type		Matrix	Number of Containers					Comments	Turnaround		Sample Disposal	
	Date	Time	grab	Comp								Normal	Rush	Return	Dispose**
TAGS # 122, 123	6/27	0925	X		SW	2	X	X			Cd, Cu, Fe, Pb, Mn, Ag, Zn	X			X
TAGS # 124, 125	6/27	1050 1025	X		SW	2	X	X			" "	X			X
TAGS # 126, 127	6/27	1245	X		SW	2	X	X			" "	X			X
TAG # 128	6/27	1245	X		SW	1			X		" "	X			X
TAG # 129	6/27	1250	X		SW	1	X					X			X
TAG # 130	6/27	1250	X		SW	1		X			" "	X			X
TAG # 131	6/27	1400	X		SW	1	X					X			X
TAG # 132	6/27	1350	X		SW	1		X			" "	X			X
TAG # 133	6/27	1445	X		SW	1	X					X			X
TAG # 134	6/27	1425	X		SW	1		X			" "	X			X
Relinquished by: 		Date/Time 6/28/00		Received by:		Relinquished by:		Date/Time		Received by:					
Relinquished by:		Date/Time		Received by:		Relinquished by:		Date/Time 6/29/00 1330		Received by Laboratory: 					

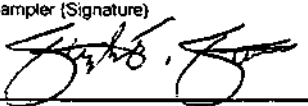
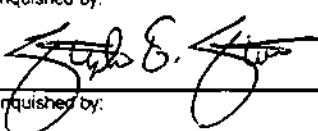
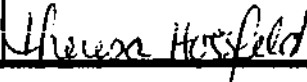
** An additional charge will be made for samples disposed of by Alpine Analytical, Inc. .



Alpine Analytical, Inc.

2814 N. Cooke, Helena, MT 59601

(406) 449-6282

Client ESA Consultants Inc.		Project ID RICO		Analysis Requested				Chain of Custody No 2030								
Sampler (Signature) 		Site ID JUNE 28, 2000		Hard, TDS, TSS	Diss Metals	TR Metals										
Sample Identification	Sample		Type		Matrix	Number of Containers	Hard, TDS, TSS	Diss Metals	TR Metals			Comments	Turnaround		Sample Disposal	
	Date	Time	grab	Comp									Normal	Rush	Return	Dispose**
TAG # 100	6/26	0930	X		SW	1			X			Cd, Cu, Fe, Pb, Mn, Ag, Zn	X			X
TAG # 101	6/26	0930	X		SW	1		X				" "	X			X
TAG # 102	6/26	0935	X		SW	1	X						X			X
TAG # 103	6/26	1005	X		SW	1			X			" "	X			X
TAG # 104	6/26	1005	X		SW	1		X				" "	X			X
TAG # 105	6/26	1010	X		SW	1	X						X			X
TAG # 106	6/26	1135	X		SW	1			X			" "	X			X
TAG # 107	6/26	1135	X		SW	1		X				" "	X			X
TAG # 108	6/26	1145	X		SW	1	X						X			X
TAG # 109	6/26	1240	X		SW	1			X			" "	X			X
Relinquished by: 		Date/Time 6/28/00		Received by:				Relinquished by:				Date/Time		Received by:		
Relinquished by:		Date/Time		Received by:				Relinquished by:				Date/Time 6/29/00 1330		Received by Laboratory 		

** An additional charge will be made for samples disposed of by Alpine Analytical, Inc..

APPENDIX B

Analytical Report Package

APPENDIX B1

Analysis Results



Case Narrative

On June 29, 2000, thirty samples from a project identified as "RICO" were received by our laboratory for analysis. The chain of custody indicated that the water samples were to be analyzed for Hardness, Total Dissolved Solids (TDS), Total Suspended Solids, Dissolved Metals, and Trace Metals. The samples were received cool, intact and delivered by UPS.

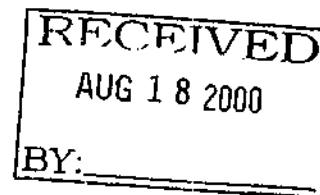
Results are summarized on the following page.

Should you have any questions regarding this analysis feel free to give us a call at 449-6282.

We appreciate the fact that you have chosen us as your analytical lab.

Sincerely yours,

Harry Howell
Laboratory Manager





Alpine Analytical, Inc.

2814 N. Cooke Street, Helena, MT 59601

(406)449-6282

Client: ESA Consultants, Inc.
 Project ID: RICO
 Site ID: JUNE 28, 2000
 Date Sampled: 26,27-Jun-00
 Date Received: 29-Jun-00
 Chain of Custody #: 2030 & 2031

Water Analysis	TAG#100	TAG# 101	TAG# 102	TAG# 103	TAG# 104	TAG# 105	TAG# 106	TAG# 107	TAG# 108	TAG# 109	TAG# 122, 123	TAG# 124, 125	TAG# 126, 127	TAG# 128	TAG# 129
Units															
Hardness	---	---	793	---	---	1189	---	---	701	---	120	102	<1	---	90
Total Dissolved Solids (TDS)	---	---	1070	---	---	1660	---	---	962	---	178	146	24	---	127
Total Suspended Solids (TSS)	---	---	5.0	---	---	26	---	---	2.0	---	1.0	1.0	1.0	---	7.0
Dissolved Metals															
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Cadmium	---	5.9	---	---	0.11	---	---	6.3	---	---	0.20	0.15	0.14	---	---
Copper	---	<10	---	---	<10	---	---	<10	---	---	30	<10	<10	---	---
Iron	---	<20	---	---	3880	---	---	<20	---	---	<20	<20	<20	---	---
Lead	---	<0.5	---	---	0.50	---	---	<0.5	---	---	0.70	<0.5	<0.5	---	---
Manganese	---	1970	---	---	1200	---	---	2550	---	---	163	12	<5	---	---
Silver	---	0.05	---	---	<0.02	---	---	0.05	---	---	0.08	<0.02	<0.02	---	---
Zinc	---	1410	---	---	90	---	---	1790	---	---	<10	20	<10	---	---
Total Recoverable Metals															
Cadmium	8.6	---	---	0.13	---	---	6.8	---	---	12	---	---	---	0.13	---
Copper	<10	---	---	<10	---	---	<10	---	---	<10	---	---	---	10	---
Iron	450	---	---	4690	---	---	580	---	---	960	---	---	---	<20	---
Lead	<0.5	---	---	0.60	---	---	<0.5	---	---	<0.5	---	---	---	0.60	---
Manganese	2070	---	---	1220	---	---	2670	---	---	5160	---	---	---	<5	---
Silver	0.05	---	---	0.09	---	---	0.04	---	---	0.09	---	---	---	<0.02	---
Zinc	1530	---	---	270	---	---	2170	---	---	2420	---	---	---	20	---



Alpine Analytical, Inc.

2814 N. Cooke Street, Helena, MT 59601

(406)449-6282

Client: ESA Consultants, Inc.
 Project ID: RICO
 Site ID: JUNE 28, 2000
 Date Sampled: 26,27-Jun-00
 Date Received: 29-Jun-00
 Chain of Custody #: 2031 & 2032

Water Analysis	TAG#130	TAG#131	TAG#132	TAG#133	TAG#134	TAG#110	TAG#111	TAG#112	TAG#113	TAG#114	TAG#115	TAG#116	TAG#117	TAG#118, 119	TAG#120, 121
Units															
Hardness	---	116	---	2149	---	---	733	---	---	12	---	---	689	148	150
Total Dissolved Solids (TDS)	---	108	---	7089	---	---	1155	---	---	974	---	---	955	188	200
Total Suspended Solids (TSS)	---	1.0	---	6.0	---	---	4.0	---	---	3.0	---	---	14	<1	2.0
Dissolved Metals															
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Cadmium	4.1	---	1.4	---	7000	10	---	---	10	---	---	18	---	0.70	0.80
Copper	20	---	10	---	5200	<10	---	---	<10	---	---	30	---	<10	<10
Iron	60	---	<20	---	844,000	<20	---	---	<20	---	---	350	---	<20	<20
Lead	0.90	---	3.2	---	505	<0.5	---	---	<0.5	---	---	<0.5	---	<0.5	<0.5
Manganese	230	---	9.6	---	149,000	4840	---	---	2650	---	---	2660	---	443	446
Silver	<0.02	---	<0.02	---	1.4	0.06	---	---	<0.02	---	---	<0.02	---	<0.02	<0.02
Zinc	380	---	770	---	230,000	1970	---	---	2620	---	---	3600	---	160	190
Total Recoverable Metals															
Cadmium	---	---	---	---	---	---	---	14	---	---	15	---	---	---	---
Copper	---	---	---	---	---	---	---	40	---	---	100	---	---	---	---
Iron	---	---	---	---	---	---	---	210	---	---	3210	---	---	---	---
Lead	---	---	---	---	---	---	---	0.80	---	---	1.6	---	---	---	---
Manganese	---	---	---	---	---	---	---	2700	---	---	2730	---	---	---	---
Silver	---	---	---	---	---	---	---	0.02	---	---	<0.02	---	---	---	---
Zinc	---	---	---	---	---	---	---	2780	---	---	3670	---	---	---	---



Alpine Analytical, Inc.

2814 N. Cooke, Helena, MT 59601

(406)449-6282

TOTAL RECOVERABLE METALS

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#100**

Project ID: RICO

Chain of Custody No.: 2030

Site ID: JUNE 28, 200

Laboratory ID: 7G291
Sample Matrix: Water

Date / Time Sampled: 26-Jun-00 @ 09:30
Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Practical	Method
		Quantitation Limit (PQL)	
Cadmium, ug/L	8.6	0.02	EPA 7131
Copper, ug/L	ND	10	EPA 6010
Iron, ug/L	450	20	EPA 7381
Lead, ug/L	ND	0.5	EPA 7421
Manganese, ug/L	2070	5	EPA 6010
Silver, ug/L	0.05	0.02	EPA 7761
Zinc, ug/L	1530	10	EPA 6010

Comments:

References:

SW-846, USEPA, 3rd. Edition.

Reviewed by: 



Alpine Analytical, Inc.

2814 N. Cooke, Helena, MT 59601

(406)449-6282

DISSOLVED METALS

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#101**

Project ID: **RICO**

Chain of Custody No.: 2030

Site ID: **JUNE 28, 200**

Laboratory ID: 7G292
Sample Matrix: Water

Date / Time Sampled: 26-Jun-00 @ 09:30
Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Practical	Method
		Quantitation Limit (PQL)	
Cadmium, ug/L	5.9	0.02	EPA 7131
Copper, ug/L	ND	10	EPA 6010
Iron, ug/L	ND	20	EPA 7381
Lead, ug/L	ND	0.5	EPA 7421
Manganese, ug/L	1970	5	EPA 6010
Silver, ug/L	0.05	0.02	EPA 7761
Zinc, ug/L	1410	10	EPA 6010

Comments:

References:

SW-846, USEPA, 3rd. Edition.

Reviewed by:



Alpine Analytical, Inc.

2814 N. Cooke, Helena, MT 59601

(406)449-6282

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#102**

Project ID: **RICO**

Site ID: **JUNE 28, 200**

Chain of Custody #: 2030

Laboratory ID: 7G293

Condition: Intact

Date / Time Sampled: 26-Jun-00 @ 09:35

Date / Time Received: 29-Jun-00 @ 13:30


Parameter	Analytical Result	Date/Time Analyzed	Method Reference
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Physical Parameters

Hardness, mg/L	793	12-Jul-00 @ 10:15	EPA 6010
Total Dissolved Solids, mg/L	1070	05-Jul-00 @ 14:30	EPA 160.1
Total Suspended Solids, mg/L	5.0	05-Jul-00 @ 14:00	EPA 160.2

References:

EPA-Methods for Chemical Analysis of Water and Wastes, US EPA, 600/4-79-020, March 1983

Reviewed by: 



Alpine Analytical, Inc.

2814 N. Cooke, Helena, MT 59601

(406)449-6282

TOTAL RECOVERABLE METALS

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#103**

Project ID: **RICO**

Chain of Custody No.: 2030

Site ID: **JUNE 28, 200**

Laboratory ID: 7G294
Sample Matrix: Water

Date / Time Sampled: 26-Jun-00 @ 10:05
Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Practical	Method
		Quantitation Limit (PQL)	
Cadmium, ug/L	0.13	0.02	EPA 7131
Copper, ug/L	ND	10	EPA 6010
Iron, ug/L	4690	20	EPA 7381
Lead, ug/L	0.60	0.5	EPA 7421
Manganese, ug/L	1220	5	EPA 6010
Silver, ug/L	0.09	0.02	EPA 7761
Zinc, ug/L	270	10	EPA 6010

Comments:

References:

SW-846, USEPA, 3rd. Edition.

Reviewed by: 



Alpine Analytical, Inc.

2814 N. Cooke, Helena, MT 59601

(406)449-6282

DISSOLVED METALS

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#104**

Project ID: RICO

Chain of Custody No.: 2030

Site ID: JUNE 28, 200

Laboratory ID: 7G295
Sample Matrix: Water

Date / Time Sampled: 26-Jun-00 @ 10:05
Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Practical	Method
		Quantitation Limit (PQL)	
Cadmium, ug/L	0.11	0.02	EPA 7131
Copper, ug/L	ND	10	EPA 6010
Iron, ug/L	3880	20	EPA 7381
Lead, ug/L	0.50	0.5	EPA 7421
Manganese, ug/L	1200	5	EPA 6010
Silver, ug/L	ND	0.02	EPA 7761
Zinc, ug/L	90	10	EPA 6010

Comments:

References:

SW-846, USEPA, 3rd. Edition.

Reviewed by: 



Alpine Analytical, Inc.

2814 N. Cooke, Helena, MT 59601

(406)449-6282

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#105**

Project ID: **RICO**

Site ID: **JUNE 28, 200**

Chain of Custody #: 2030

Laboratory ID: 7G296

Date / Time Sampled: 26-Jun-00 @ 10:10

Condition: Intact

Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Date/Time Analyzed	Method Reference
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Physical Parameters

Hardness, mg/L	1189	12-Jul-00 @ 10:15	EPA 130.2
Total Dissolved Solids, mg/L	1660	05-Jul-00 @ 14:30	EPA 160.1
Total Suspended Solids, mg/L	26	05-Jul-00 @ 14:00	EPA 160.2

References:

EPA-Methods for Chemical Analysis of Water and Wastes, US EPA, 600/4-79-020, March 1983

Reviewed by:



Alpine Analytical, Inc.

2814 N. Cooke, Helena, MT 59601

(406)449-6282

TOTAL RECOVERABLE METALS

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#106**

Project ID: **RICO**

Chain of Custody No.: 2030

Site ID: **JUNE 28, 200**

Laboratory ID: 7G297
Sample Matrix: Water

Date / Time Sampled: 26-Jun-00 @ 11:35
Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Practical	Method
		Quantitation Limit (PQL)	
Cadmium, ug/L	6.8	0.02	EPA 7131
Copper, ug/L	ND	10	EPA 6010
Iron, ug/L	580	20	EPA 7381
Lead, ug/L	ND	0.5	EPA 7421
Manganese, ug/L	2670	5	EPA 6010
Silver, ug/L	0.04	0.02	EPA 7761
Zinc, ug/L	2170	10	EPA 6010

Comments:

References:

SW-846, USEPA, 3rd. Edition.

Reviewed by:



Alpine Analytical, Inc.

2814 N. Cooke, Helena, MT 59601

(406)449-6282

DISSOLVED METALS

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#107**

Project ID: **RICO**

Chain of Custody No.: 2030

Site ID: **JUNE 28, 200**

Laboratory ID: 7G298
Sample Matrix: Water

Date / Time Sampled: 26-Jun-00 @ 11:35
Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Practical	Method
		Quantitation Limit (PQL)	
Cadmium, ug/L	6.3	0.02	EPA 7131
Copper, ug/L	ND	10	EPA 6010
Iron, ug/L	ND	20	EPA 7381
Lead, ug/L	ND	0.5	EPA 7421
Manganese, ug/L	2550	5	EPA 6010
Silver, ug/L	0.05	0.02	EPA 7761
Zinc, ug/L	1790	10	EPA 6010

Comments:

References:

SW-846, USEPA, 3rd. Edition.

Reviewed by:



Alpine Analytical, Inc.

2814 N. Cooke, Helena, MT 59601

(406)449-6282

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#108**

Project ID: **RICO**

Site ID: **JUNE 28, 200**

Chain of Custody #: 2030

Laboratory ID: 7G299

Condition: Intact

Date / Time Sampled: 26-Jun-00 @ 11:45

Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Date/Time Analyzed	Method Reference
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Physical Parameters

Hardness, mg/L	701	12-Jul-00 @ 10:15	EPA 130.2
Total Dissolved Solids, mg/L	962	05-Jul-00 @ 14:30	EPA 160.1
Total Suspended Solids, mg/L	2.0	05-Jul-00 @ 14:00	EPA 160.2

References:

EPA-Methods for Chemical Analysis of Water and Wastes, US EPA, 600/4-79-020, March 1983

Reviewed by:



Alpine Analytical, Inc.

2814 N. Cooke, Helena, MT 59601

(406)449-6282

TOTAL RECOVERABLE METALS

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#109**

Project ID: **RICO**

Chain of Custody No.: 2030

Site ID: **JUNE 28, 200**

Laboratory ID: 7G300
Sample Matrix: Water

Date / Time Sampled: 26-Jun-00 @ 12:40
Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Practical	Method
		Quantitation Limit (PQL)	
Cadmium, ug/L	12	0.02	EPA 7131
Copper, ug/L	ND	10	EPA 6010
Iron, ug/L	960	20	EPA 7381
Lead, ug/L	ND	0.5	EPA 7421
Manganese, ug/L	5160	5	EPA 6010
Silver, ug/L	0.09	0.02	EPA 7761
Zinc, ug/L	2420	10	EPA 6010

Comments:

References:

SW-846, USEPA, 3rd. Edition.

Reviewed by:



Alpine Analytical, Inc.

2814 N. Cooke, Helena, MT 59601

(406)449-6282

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#122, 123**

Project ID: **RICO**

Chain of Custody #: 2031

Site ID: **JUNE 28, 200**

Laboratory ID: 7G301

Date / Time Sampled: 27-Jun-00 @ 09:25

Condition: Intact

Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Date/Time Analyzed	Method Reference
-----------	----------------------	--------------------	---------------------

Physical Parameters

Hardness, mg/L	120	12-Jul-00 @ 10:15	EPA 130.2
Total Dissolved Solids, mg/L	178	05-Jul-00 @ 14:30	EPA 160.1
Total Suspended Solids, mg/L	1.0	05-Jul-00 @ 14:00	EPA 160.2

References:

EPA-Methods for Chemical Analysis of Water and Wastes, US EPA, 600/4-79-020, March 1983

Reviewed by:



Alpine Analytical, Inc.

2814 N. Cooke, Helena, MT 59601

(406)449-6282

DISSOLVED METALS

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#122, 123**

Project ID: **RICO**

Chain of Custody No.: 2031

Site ID: **JUNE 28, 200**

Laboratory ID: 7G301
Sample Matrix: Water

Date / Time Sampled: 27-Jun-00 @ 09:25
Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Practical	Method
		Quantitation Limit (PQL)	
Cadmium, ug/L	0.20	0.02	EPA 7131
Copper, ug/L	30	10	EPA 6010
Iron, ug/L	ND	20	EPA 7381
Lead, ug/L	0.70	0.5	EPA 7421
Manganese, ug/L	163	5	EPA 6010
Silver, ug/L	0.08	0.02	EPA 7761
Zinc, ug/L	ND	10	EPA 6010

Comments:

References:

SW-846, USEPA, 3rd. Edition.

Reviewed by:



Alpine Analytical, Inc.

2814 N. Cooke, Helena, MT 59601

(406)449-6282

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#124, 125**

Project ID: **RICO**

Site ID: **JUNE 28, 200**

Chain of Custody #: 2031

Laboratory ID: 7G302

Condition: Intact

Date / Time Sampled: 27-Jun-00 @ 10:25

Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Date/Time Analyzed	Method Reference
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Physical Parameters

Hardness, mg/L	102	12-Jul-00 @ 10:15	EPA 6010
Total Dissolved Solids, mg/L	146	05-Jul-00 @ 14:30	EPA 160.1
Total Suspended Solids, mg/L	1.0	05-Jul-00 @ 14:00	EPA 160.2

References:

EPA-Methods for Chemical Analysis of Water and Wastes, US EPA, 600/4-79-020, March 1983

Reviewed by: _____



Alpine Analytical, Inc.

2814 N. Cooke, Helena, MT 59601

(406)449-6282

DISSOLVED METALS

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#124, 125**

Project ID: **RICO**

Chain of Custody No.: 2031

Site ID: **JUNE 28, 200**

Laboratory ID: 7G302
Sample Matrix: Water

Date / Time Sampled: 27-Jun-00 @ 10:25
Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Practical	Method
		Quantitation Limit (PQL)	
Cadmium, ug/L	0.15	0.02	EPA 7131
Copper, ug/L	ND	10	EPA 6010
Iron, ug/L	ND	20	EPA 7381
Lead, ug/L	ND	0.5	EPA 7421
Manganese, ug/L	12	5	EPA 6010
Silver, ug/L	ND	0.02	EPA 7761
Zinc, ug/L	20	10	EPA 6010

Comments:

References:

SW-846, USEPA, 3rd. Edition.

Reviewed by: 



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2814 N. Cooke, Helena, MT 59601

(406)449-6282

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#126, 127**

Project ID: **RICO**

Site ID: **JUNE 28, 200**

Chain of Custody #: 2031

Laboratory ID: 7G303

Condition: Intact

Date / Time Sampled: 27-Jun-00 @ 12:45

Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Date/Time Analyzed	Method Reference
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Physical Parameters

Hardness, mg/L	<1	12-Jul-00 @ 10:15	EPA 130.2
Total Dissolved Solids, mg/L	24	05-Jul-00 @ 14:30	EPA 160.1
Total Suspended Solids, mg/L	1.0	05-Jul-00 @ 14:00	EPA 160.2

References:

EPA-Methods for Chemical Analysis of Water and Wastes, US EPA, 600/4-79-020, March 1983

Reviewed by:



Alpine Analytical, Inc.

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(406)449-6282

DISSOLVED METALS

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#126, 127**

Project ID: RICO

Chain of Custody No.: 2031

Site ID: JUNE 28, 200

Laboratory ID: 7G303
Sample Matrix: Water

Date / Time Sampled: 27-Jun-00 @ 12:45
Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Practical	Method
		Quantitation Limit (PQL)	
Cadmium, ug/L	0.14	0.02	EPA 7131
Copper, ug/L	ND	10	EPA 6010
Iron, ug/L	ND	20	EPA 7381
Lead, ug/L	ND	0.5	EPA 7421
Manganese, ug/L	ND	5	EPA 6010
Silver, ug/L	ND	0.02	EPA 7761
Zinc, ug/L	ND	10	EPA 6010

Comments:

References:

SW-846, USEPA, 3rd. Edition.

Reviewed by:



Alpine Analytical, Inc.

2814 N. Cooke, Helena, MT 59601

(406)449-6282

TOTAL RECOVERABLE METALS

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#128**

Project ID: **RICO**

Site ID: **JUNE 28, 200**

Chain of Custody No.: 2031

Laboratory ID: 7G304
Sample Matrix: Water

Date / Time Sampled: 27-Jun-00 @ 12:45
Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Practical	Method
		Quantitation Limit (PQL)	
Cadmium, ug/L	0.13	0.02	EPA 7131
Copper, ug/L	10	10	EPA 6010
Iron, ug/L	ND	20	EPA 7381
Lead, ug/L	0.60	0.5	EPA 7421
Manganese, ug/L	ND	5	EPA 6010
Silver, ug/L	ND	0.02	EPA 7761
Zinc, ug/L	20	10	EPA 6010

Comments:

References:

SW-846, USEPA, 3rd. Edition.

Reviewed by:



Alpine Analytical, Inc.

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(406)449-6282

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#129**

Project ID: **RICO**

Site ID: **JUNE 28, 200**

Chain of Custody #: 2031

Laboratory ID: 7G305

Condition: Intact

Date / Time Sampled: 27-Jun-00 @ 12:50

Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Date/Time Analyzed	Method Reference
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Physical Parameters

Hardness, mg/L	90	12-Jul-00 @ 10:15	EPA 130.2
Total Dissolved Solids, mg/L	127	05-Jul-00 @ 14:30	EPA 160.1
Total Suspended Solids, mg/L	7.0	05-Jul-00 @ 14:00	EPA 160.2

References:

EPA-Methods for Chemical Analysis of Water and Wastes, US EPA, 600/4-79-020, March 1983

Reviewed by: 



Alpine Analytical, Inc.

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(406)449-6282

DISSOLVED METALS

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#130**

Project ID: RICO

Chain of Custody No.: 2031

Site ID: JUNE 28, 2000

Laboratory ID:	7G306	Date / Time Sampled:	27-Jun-00 @ 12:50
Sample Matrix:	Water	Date / Time Received:	29-Jun-00 @ 13:30

Parameter	Analytical Result	Practical	
		Quantitation Limit (PQL)	Method
Cadmium, ug/L	4.1	0.02	EPA 7131
Copper, ug/L	20	10	EPA 6010
Iron, ug/L	60	20	EPA 7381
Lead, ug/L	0.90	0.5	EPA 7421
Manganese, ug/L	230	5	EPA 6010
Silver, ug/L	ND	0.02	EPA 7761
Zinc, ug/L	380	10	EPA 6010

Comments:

References:

SW-846, USEPA, 3rd. Edition.

Reviewed by: _____



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(406)449-6282

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#131**

Project ID: **RICO**

Site ID: **JUNE 28, 2000**

Chain of Custody #: 2031

Laboratory ID: 7G307

Condition: Intact

Date / Time Sampled: 27-Jun-00 @ 14:00

Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Date/Time Analyzed	Method Reference
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Physical Parameters

Hardness, mg/L	116	31-Aug-00 @ 13:03	EPA 130.2
Total Dissolved Solids, mg/L	108	31-Aug-00 @ 16:00	EPA 160.1
Total Suspended Solids, mg/L	1.0	05-Jul-00 @ 14:00	EPA 160.2

References:

EPA-Methods for Chemical Analysis of Water and Wastes, US EPA, 600/4-79-020, March 1983

Reviewed by: 



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(406)449-6282

DISSOLVED METALS

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#132**

Project ID: **RICO**

Site ID: **JUNE 28, 2000**

Chain of Custody No.: 2031

Laboratory ID: 7G308
Sample Matrix: Water

Date / Time Sampled: 27-Jun-00 @ 13:50
Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Practical	Method
		Quantitation Limit (PQL)	
Cadmium, ug/L	1.4	0.02	EPA 6010
Copper, ug/L	10	10	EPA 6010
Iron, ug/L	ND	20	EPA 6010
Lead, ug/L	3.2	0.5	EPA 7421
Manganese, ug/L	9.6	5	EPA 6010
Silver, ug/L	ND	0.02	EPA 7761
Zinc, ug/L	770	10	EPA 6010

Comments:

References:

SW-846, USEPA, 3rd. Edition.

Reviewed by: 



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(406)449-6282

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#133**

Project ID: **RICO**

Chain of Custody #: 2031

Site ID: **JUNE 28, 2000**

Laboratory ID: 7G309

Date / Time Sampled: 27-Jun-00 @ 14:45

Condition: Intact

Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Date/Time Analyzed	Method Reference
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Physical Parameters

Hardness, mg/L	2149	12-Jul-00 @ 10:15	EPA 130.2
Total Dissolved Solids, mg/L	7089	05-Jul-00 @ 14:30	EPA 160.1
Total Suspended Solids, mg/L	6.0	05-Jul-00 @ 14:00	EPA 160.2

References:

EPA-Methods for Chemical Analysis of Water and Wastes, US EPA, 600/4-79-020, March 1983

Reviewed by:



Alpine Analytical, Inc.

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DISSOLVED METALS

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#134**

Project ID: RICO

Chain of Custody No.: 2031

Site ID: JUNE 28, 2000

Laboratory ID: 7G310
Sample Matrix: Water

Date / Time Sampled: 27-Jun-00 @ 14:25
Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Practical	Method
		Quantitation Limit (PQL)	
Cadmium, ug/L	7000	0.02	EPA 7131
Copper, ug/L	5200	10	EPA 6010
Iron, ug/L	844,000	20	EPA 7381
Lead, ug/L	505	0.5	EPA 7421
Manganese, ug/L	149,000	5	EPA 6010
Silver, ug/L	1.4	0.02	EPA 7761
Zinc, ug/L	230,000	10	EPA 6010

Comments:

References:

SW-846, USEPA, 3rd. Edition.

Reviewed by:



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(406)449-6282

DISSOLVED METALS

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#110**

Project ID: **RICO**

Chain of Custody No.: 2032

Site ID: **JUNE 28, 2000**

Laboratory ID: 7G311
Sample Matrix: Water

Date / Time Sampled: 26-Jun-00 @ 12:40
Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Practical	Method
		Quantitation Limit (PQL)	
Cadmium, ug/L	10	0.02	EPA 7131
Copper, ug/L	ND	10	EPA 6010
Iron, ug/L	ND	20	EPA 7381
Lead, ug/L	ND	0.5	EPA 7421
Manganese, ug/L	4840	5	EPA 6010
Silver, ug/L	0.06	0.02	EPA 7761
Zinc, ug/L	1970	10	EPA 6010

Comments:

References:

SW-846, USEPA, 3rd. Edition.

Reviewed by:



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(406)449-6282

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#111**

Project ID: **RICO**

Site ID: **JUNE 28, 2000**

Chain of Custody #: 2032

Laboratory ID: 7G312

Condition: Intact

Date / Time Sampled: 26-Jun-00 @ 12:45

Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Date/Time Analyzed	Method Reference
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Physical Parameters

Hardness, mg/L	733	12-Jul-00 @ 10:15	EPA 130.2
Total Dissolved Solids, mg/L	1155	05-Jul-00 @ 14:30	EPA 160.1
Total Suspended Solids, mg/L	4.0	05-Jul-00 @ 14:00	EPA 160.2

References:

EPA-Methods for Chemical Analysis of Water and Wastes, US EPA, 600/4-79-020, March 1983

Reviewed by: _____



Alpine Analytical, Inc.

2814 N. Cooke, Helena, MT 59601

(406)449-6282

TOTAL RECOVERABLE METALS

Client: ESA Consultants, Inc.

Date Reported: 26-Jul-00

Sample ID: TAG#112

Project ID: RICO

Chain of Custody No.: 2032

Site ID: JUNE 28, 2000

Laboratory ID:	7G313	Date / Time Sampled:	26-Jun-00 @ 14:20
Sample Matrix:	Water	Date / Time Received:	29-Jun-00 @ 13:30

Parameter	Analytical Result	Practical	Method
		Quantitation Limit (PQL)	
Cadmium, ug/L	14	0.02	EPA 7131
Copper, ug/L	40	10	EPA 6010
Iron, ug/L	210	20	EPA 7381
Lead, ug/L	0.80	0.5	EPA 7421
Manganese, ug/L	2700	5	EPA 6010
Silver, ug/L	0.02	0.02	EPA 7761
Zinc, ug/L	2780	10	EPA 6010

Comments:

References:

SW-846, USEPA, 3rd. Edition.

Reviewed by:



Alpine Analytical, Inc.

2814 N. Cooke, Helena, MT 59601

(406)449-6282

DISSOLVED METALS

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#113**

Project ID: RICO

Chain of Custody No.: 2032

Site ID: JUNE 28, 2000

Laboratory ID:	7G314	Date / Time Sampled:	26-Jun-00 @ 14:20
Sample Matrix:	Water	Date / Time Received:	29-Jun-00 @ 13:30

Parameter	Analytical Result	Practical	Method
		Quantitation Limit (PQL)	
Cadmium, ug/L	10	0.02	EPA 7131
Copper, ug/L	ND	10	EPA 6010
Iron, ug/L	ND	20	EPA 7381
Lead, ug/L	ND	0.5	EPA 7421
Manganese, ug/L	2650	5	EPA 6010
Silver, ug/L	ND	0.02	EPA 7761
Zinc, ug/L	2620	10	EPA 6010

Comments:

References:

SW-846, USEPA, 3rd. Edition.

Reviewed by:



Alpine Analytical, Inc.

2814 N. Cooke, Helena, MT 59601

(406)449-6282

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#114**

Project ID: **RICO**

Chain of Custody #: 2032

Site ID: **JUNE 28, 2000**

Laboratory ID: 7G315

Date / Time Sampled: 26-Jun-00 @ 14:25

Condition: Intact

Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Date/Time Analyzed	Method Reference
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Physical Parameters

Hardness, mg/L	12	12-Jul-00 @ 10:15	EPA 130.2
Total Dissolved Solids, mg/L	974	05-Jul-00 @ 14:30	EPA 160.1
Total Suspended Solids, mg/L	3.0	05-Jul-00 @ 14:00	EPA 160.2

References:

EPA-Methods for Chemical Analysis of Water and Wastes, US EPA, 600/4-79-020, March 1983

Reviewed by: *sk*



Alpine Analytical, Inc.

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(406)449-6282

TOTAL RECOVERABLE METALS

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#115**

Project ID: **RICO**

Site ID: **JUNE 28, 2000**

Chain of Custody No.: 2032

Laboratory ID: 7G316
Sample Matrix: Water

Date / Time Sampled: 26-Jun-00 @ 14:45
Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Practical	Method
		Quantitation Limit (PQL)	
Cadmium, ug/L	15	0.02	EPA 7131
Copper, ug/L	100	10	EPA 6010
Iron, ug/L	3210	20	EPA 7381
Lead, ug/L	1.6	0.5	EPA 7421
Manganese, ug/L	2730	5	EPA 6010
Silver, ug/L	ND	0.02	EPA 7761
Zinc, ug/L	3670	10	EPA 6010

Comments:

References:

SW-846, USEPA, 3rd. Edition.

Reviewed by:



Alpine Analytical, Inc.

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(406)449-6282

DISSOLVED METALS

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#116**

Project ID: **RICO**

Site ID: **JUNE 28, 2000**

Chain of Custody No.: 2032

Laboratory ID: 7G317
Sample Matrix: Water

Date / Time Sampled: 26-Jun-00 @ 14:45
Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Practical	Method
		Quantitation Limit (PQL)	
Cadmium, ug/L	18	0.02	EPA 7131
Copper, ug/L	30	10	EPA 6010
Iron, ug/L	350	20	EPA 7381
Lead, ug/L	ND	0.5	EPA 7421
Manganese, ug/L	2660	5	EPA 6010
Silver, ug/L	ND	0.02	EPA 7761
Zinc, ug/L	3600	10	EPA 6010

Comments:

References:

SW-846, USEPA, 3rd. Edition.

Reviewed by:



Alpine Analytical, Inc.

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Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#117**

Project ID: **RICO**

Chain of Custody #: 2032

Site ID: **JUNE 28, 2000**

Laboratory ID: 7G318

Date / Time Sampled: 26-Jun-00 @ 14:55

Condition: Intact

Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Date/Time Analyzed	Method Reference
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Physical Parameters

Hardness, mg/L	689	12-Jul-00 @ 10:15	EPA 130.2
Total Dissolved Solids, mg/L	955	05-Jul-00 @ 14:30	EPA 160.1
Total Suspended Solids, mg/L	14	05-Jul-00 @ 14:00	EPA 160.2

References:

EPA-Methods for Chemical Analysis of Water and Wastes, US EPA, 600/4-79-020, March 1983

Reviewed by:



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(406)449-6282

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#118, 119**

Project ID: **RICO**

Chain of Custody #: 2032

Site ID: **JUNE 28, 2000**

Laboratory ID: 7G319

Date / Time Sampled: 27-Jun-00 @ 08:25

Condition: Intact

Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Date/Time Analyzed	Method Reference
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Physical Parameters

Hardness, mg/L	148	12-Jul-00 @ 10:15	EPA 130.2
Total Dissolved Solids, mg/L	188	31-Aug-00 @ 16:00	EPA 160.1
Total Suspended Solids, mg/L	<1	05-Jul-00 @ 14:00	EPA 160.2

References:

EPA-Methods for Chemical Analysis of Water and Wastes, US EPA, 600/4-79-020, March 1983

Reviewed by: 



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2814 N. Cooke, Helena, MT 59601

(406)449-6282

DISSOLVED METALS

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#118, 119**

Project ID: **RICO**

Chain of Custody No.: 2032

Site ID: **JUNE 28, 2000**

Laboratory ID: 7G319
Sample Matrix: Water

Date / Time Sampled: 27-Jun-00 @ 08:25
Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Practical	Method
		Quantitation Limit (PQL)	
Cadmium, ug/L	0.70	0.02	EPA 7131
Copper, ug/L	ND	10	EPA 6010
Iron, ug/L	ND	20	EPA 7381
Lead, ug/L	ND	0.5	EPA 7421
Manganese, ug/L	443	5	EPA 6010
Silver, ug/L	ND	0.02	EPA 7761
Zinc, ug/L	160	10	EPA 6010

Comments:

References:

SW-846, USEPA, 3rd. Edition.

Reviewed by: _____



Alpine Analytical, Inc.

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Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **Tag#120, 121**

Project ID: **RICO**

Site ID: **JUNE 28, 2000**

Chain of Custody #: 2032

Laboratory ID: 7G320

Condition: Intact

Date / Time Sampled: 27-Jun-00 @ 08:25

Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Date/Time Analyzed	Method Reference
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Physical Parameters

Hardness, mg/L	150	12-Jul-00 @ 10:15	EPA 130.2
Total Dissolved Solids, mg/L	200	31-Aug-00 @ 16:00	EPA 160.1
Total Suspended Solids, mg/L	2.0	05-Jul-00 @ 14:00	EPA 160.2

References:

EPA-Methods for Chemical Analysis of Water and Wastes, US EPA, 600/4-79-020, March 1983

Reviewed by:  _____



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(406)449-6282

DISSOLVED METALS

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **Tag#120, 121**

Project ID: RICO

Chain of Custody No.: 2032

Site ID: JUNE 28, 2000

Laboratory ID: 7G320
Sample Matrix: Water

Date / Time Sampled: 27-Jun-00 @ 08:25
Date / Time Received: 29-Jun-00 @ 13:30

Parameter	Analytical Result	Practical	Method
		Quantitation Limit (FQL)	
Cadmium, ug/L	0.80	0.02	EPA 7131
Copper, ug/L	ND	10	EPA 6010
Iron, ug/L	ND	20	EPA 7381
Lead, ug/L	ND	0.5	EPA 7421
Manganese, ug/L	446	5	EPA 6010
Silver, ug/L	ND	0.02	EPA 7761
Zinc, ug/L	190	10	EPA 6010

Comments:

References:

SW-846, USEPA, 3rd. Edition.

Reviewed by:

APPENDIX B2

Laboratory Quality Control Results

Quality

Control

Data



Alpine Analytical, Inc.

2814 N. Cooke, Helena, MT 59601

(406)449-6282

METALS Quality Control Sample

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **Quality Control Sample**

Project ID: RICO

Site ID: JUNE 28, 2000

Laboratory ID: QC
Sample Matrix: Water

Parameter	Analytical Result	TRUE Value	Range
Cadmium, ug/L	0.005	0.005	0.004 - 0.006
Copper, ug/L	0.31	0.30	0.27 - 0.34
Iron, ug/L	0.33	0.33	0.29 - 0.38
Lead, ug/L	13.2	12.5	11.5 - 13.5
Manganese, ug/L	2.3	2.1	1.9 - 2.3
Silver, ug/L	0.78	0.80	0.70 - 0.90
Zinc, ug/L	1.6	1.6	1.4 - 1.8

Comments:

References:

SW-846, USEPA, 3rd. Edition.

Reviewed by:



Alpine Analytical, Inc.

2814 N. Cooke, Helena, MT 59601

(406)449-6282

DISSOLVED METALS Duplicate analysis

Client: ESA Consultants, Inc.

Date Reported: 26-Jul-00

Sample ID: TAG#101 --Duplicate

Project ID: RICO

Site ID: JUNE 28, 2000

Laboratory ID: 7G292-DUP
Sample Matrix: Water

Parameter	Analytical Result	Duplicate Result	% Difference
Cadmium, ug/L	6.5	6.7	-3.1%
Copper, ug/L	<10	<10	NA
Iron, ug/L	<20	<20	NA
Lead, ug/L	<0.5	<0.5	NA
Manganese, ug/L	1970	1950	1.0%
Silver, ug/L	0.06	0.06	0.0%
Zinc, ug/L	1410	1420	-0.7%

Comments:

References:

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Reviewed by:



DISSOLVED METALS
Duplicate analysis

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **TAG#126, 127 --Duplicate**

Project ID: **RICO**

Site ID: **JUNE 28, 2000**

Laboratory ID: 7G303-DUP
Sample Matrix: Water

Parameter	Analytical Result	Duplicate Result	% Difference
Cadmium, ug/L	0.14	0.13	7.1%
Copper, ug/L	<10	<10	NA
Iron, ug/L	<20	<20	NA
Lead, ug/L	<0.5	<0.5	NA
Manganese, ug/L	<5	<5	NA
Silver, ug/L	0.14	0.15	-7.1%
Zinc, ug/L	<10	<10	NA

Comments:

References:

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DISSOLVED METALS Duplicate analysis

Client: ESA Consultants, Inc.

Date Reported: 26-Jul-00

Sample ID: TAG#118, 119 --Duplicate

Project ID: RICO

Site ID: JUNE 28, 2000


Laboratory ID: 7G319-DUP
Sample Matrix: Water

Parameter	Analytical Result	Duplicate Result	% Difference
Cadmium, ug/L	0.70	0.60	14%
Copper, ug/L	<10	<10	NA
Iron, ug/L	<20	<20	NA
Lead, ug/L	<0.5	<0.5	NA
Manganese, ug/L	443	431	2.7%
Silver, ug/L	<0.02	<0.02	NA
Zinc, ug/L	160	190	-19%

Comments:

References:

SW-846, USEPA, 3rd. Edition.

Reviewed by: 



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Quality Control Sample

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **QUALITY CONTROL SAMPLE**

Project ID: RICO

Site ID: JUNE 28, 2000

Laboratory ID: QC samples

Condition: Intact

Parameter	Analytical Result	True Value	Range	Method Reference
Hardness, mg/L	57	59	52 - 66	EPA 130.2
Total Dissolved Solids, mg/L	704	700	630 - 770	EPA 160.1
Total Suspended Solids, mg/L	266	250	225 - 275	EPA 160.2

Comments:

References:

Methods for Chemical Analysis of Water and Wastes, US EPA, 600/4-79-020, March 1983.

Analyzed by: _____



Alpine Analytical, Inc.

2814 N. Cooke, Helena, MT 59601

(406)449-6282

Client: **ESA Consultants, Inc.**

Date Reported: 26-Jul-00

Sample ID: **DUPLICATE**

Project ID: RICO

Site ID: JUNE 28, 2000

Laboratory ID: DUP
Condition: Intact

Parameter	Analytical Result	Duplicate Result	% Difference
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Physical Parameters

Hardness, mg/L	994	984	1%
Total Dissolved Solids, mg/L	2577	2644	3%
Total Suspended Solids, mg/L	26	26	0%

References:

EPA-Methods for Chemical Analysis of Water and Wastes, US EPA, 600/4-79-020, March 1983

Reviewed by: _____

APPENDIX B3

Field Quality Control Results

TABLE B3

Field Quality Control Sample Results

Parameter	Units	DR-7	DR-7 Field Duplicate	Duplicate RPD ⁽¹⁾	Field Blank
General Parameters					
Hardness	mg/L as CaCO ₃	148	150	1.3	<1
Total Dissolved Solids	mg/L as TDS	188	200	6.2	24
Total Suspended Solids	mg/L as TSS	<1.0	2.0	---	1.0
Dissolved Trace Metals					
Cadmium	μg/L as Cd	0.70	0.80	13.3	0.14
Copper	μg/L as Cu	<10	<10	---	<10
Iron	μg/L as Fe	<20	<20	---	<20
Lead	μg/L as Pb	<0.5	<0.5	---	<0.5
Manganese	μg/L as Mn	443	446	0.7	<5.0
Silver	μg/L as Ag	<0.02	<0.02	---	<0.02
Zinc	μg/L as Zn	160	190	17.1	<10
Total Recoverable Trace Metals					
Cadmium	μg/L as Cd				0.13
Copper	μg/L as Cu				10
Iron	μg/L as Fe				<20
Lead	μg/L as Pb				0.60
Manganese	μg/L as Mn				<5.0
Silver	μg/L as Ag				<0.02
Zinc	μg/L as Zn				20
(1) Relative Percent Difference. Control Limit, RPD ≤ 20					

APPENDIX C

Water Quality Results from October, 1999 Sampling Event

**UPPER DOLORES RIVER AND SILVER CREEK BASIN
WATER QUALITY MONITORING SUMMARY
RICO, COLORADO**

Analysis results from samples collected in the Silver Creek Basin on October 25, 1999, are provided in Table C1. Results are presented with Colorado stream standards for Silver Creek below the Town of Rico's water supply intake (Segment 9). For hardness based standards, a hardness value of 135 mg/L as CaCO₃ was used to calculate standard values. This hardness value was measured in sample SC-3 collected from Silver Creek below the Blaine adit discharge.

TABLE C1

Silver Creek Basin Analysis Results

Parameter	Units	Standard ⁽¹⁾	SC-1 Silver Ck above Blaine Adit	SC-2 Blaine Adit	SC-3 Silver Ck below Blaine Adit
Field Parameters					
Flow	gpm		---	1.4	---
pH	s.u.	6.5 - 9.0	7.69	2.22	7.66
Temperature	°C		5.0	2.6	3.8
Conductivity	µmhos/cm		239	6,890	274
Alkalinity	mg/L as CaCO ₃		96	<10	77
General Parameters					
Hardness	mg/L as CaCO ₃		100	2,025	135
Total Dissolved Solids	mg/L as TDS		112	11,400	147
Total Suspended Solids	mg/L as TSS		<1.0	18	9.0
Dissolved Trace Metals					
Cadmium	µg/L as Cd	13.8/5.0	0.23	2,000	17
Copper	µg/L as Cu	23.5/15.3	<10	50,000	<10
Iron	µg/L as Fe	/1,000	75	1,500,000	1,000
Lead	µg/L as Pb	156/5.95	1.5	99	<0.5
Manganese	µg/L as Mn	/1,000	34	115,000	600
Silver	µg/L as Ag	3.41/0.54	0.07	1.5	0.08
Zinc	µg/L as Zn	/1,100	1,480	489,000	3,250
(1) acute/chronic - Colorado stream standards (dissolved metals) for Silver Creek below the Town of Rico's water supply intake (Segment 9). The hardness value measured at the downstream sampling site SC-3 (135 mg/L as CaCO ₃) was used for hardness based standards.					

At SC-2, flow from the Blaine adit was measured at 1.4 gallons per minute (Figure 3). The discharge was very acidic with a pH of 2.22 and contained high concentrations of total dissolved solids (11,400 mg/L) and dissolved metals (Table C1).

Comparison of the Silver Creek results at SC-3 with stream standards indicates that the concentration of dissolved cadmium exceeds the acute standard of 13.8 mg/L. In addition, the concentration of dissolved zinc in the grab sample is higher than the chronic standard of 1,100 mg/L. These concentrations of cadmium and zinc, along with the measured concentrations of dissolved iron and manganese, were significantly higher than the range of concentrations measured during VCUP monitoring. During the VCUP monitoring program, measured concentrations of dissolved cadmium and zinc did not exceed acute or chronic standard values at site SC-3. The Blaine adit discharge (SC-2) and Silver Creek flows upstream of the adit (SC-1) were not measured or sampled during VCUP monitoring, so the reason for the change in Silver Creek water quality below the adit is not known.

Samples from the Upper Dolores River Basin were collected on October 24, 1999. Dolores River sample results are presented in Table C2 with stream standards for Section 3. For hardness based standards, a hardness value of 283 mg/L as CaCO_3 was used to calculate standard values. This hardness value was measured in sample DR-7, the Dolores River below the St. Louis tunnel settling pond system. Comparison of the Dolores River results at DR-7 with stream standards indicates that the measured concentrations of dissolved metals do not exceed standard values. These results are consistent with VCUP monitoring results from the Dolores River further downstream.

TABLE C2

Upper Dolores River Analysis Results

Parameter	Units	Standard ⁽¹⁾	DR-1	DR-2	DR-7
			Dolores River above Ponds	Dolores River above Outfall	Dolores River below Ponds
Field Parameters					
pH	s.u.	6.5 - 9.0	8.20	7.86	6.48
Temperature	°C		8.4	5.1	2.5
Conductivity	µmhos/cm		274	407	516
Alkalinity	mg/L as CaCO ₃		82	92	114
General Parameters					
Hardness	mg/L as CaCO ₃		144	181	283
Total Dissolved Solids	mg/L as TDS		154	214	314
Total Suspended Solids	mg/L as TSS		<1.0	<1.0	<1.0
Dissolved Trace Metals					
Cadmium	µg/L as Cd	31.9/2.57	0.26	0.41	2.2
Copper	µg/L as Cu	47.3/28.8	<10	<10	<10
Iron	µg/L as Fe	/1,000	<20	54	115
Lead	µg/L as Pb	514/17.0	0.90	0.80	1.0
Manganese	µg/L as Mn	/1,000	100	400	500
Silver	µg/L as Ag	12.2/1.92	0.30	0.39	0.83
Zinc	µg/L as Zn	283/256	<10	<10	130
(1) acute/chronic - Colorado stream standards (dissolved metals) for the Dolores River Segment 3. The hardness value measured at the downstream sampling site DR-7 (283 mg/L as CaCO ₃) was used for hardness based standards.					

Sample results from the St. Louis tunnel settling pond system are presented in Table C3 with the 30-day average effluent limitations for Outfall 002 (CDPS Permit Number CO-0029793, expired January 31, 1999). Samples were collected at the tunnel discharge (Figure 4), Pond 18 discharge (Figure 5), Pond 11 discharge, and Outfall 002 (Figure 7). Comparison of the total recoverable trace metal results from Outfall 002 with the effluent limitations indicates that concentrations of cadmium, silver, and zinc were greater than 30-day average effluent limitation values. Additional comparison indicates that total recoverable concentrations of cadmium, silver, and zinc in the Pond 18, Pond 11, and St. Louis tunnel discharges were also greater than effluent limitation values.

St. Louis Tunnel Settling Pond System Analysis Results

Parameter	Units	Effluent Limitation ⁽¹⁾	DR-3	DR-4	DR-5	DR-6
			Tunnel Discharge	Pond 18 Discharge	Pond 11 Discharge	Outfall 002
Field Parameters						
pH	s.u.	6.5 - 9.0	7.04	8.01	7.82	7.38
Temperature	°C		18.3	16.7	10.0	6.8
Conductivity	µmhos/cm		1,010	1,010	1,030	1,020
Alkalinity	mg/L as CaCO ₃		92	91	80	108
General Parameters						
Hardness	mg/L as CaCO ₃		490	533	519	710
Total Dissolved Solids	mg/L as TDS		893	913	907	969
Total Suspended Solids	mg/L as TSS		19	11	7.0	3.0
Dissolved Trace Metals						
Cadmium	µg/L as Cd		12	15	15	8.7
Copper	µg/L as Cu		<10	<10	<10	<10
Iron	µg/L as Fe		3,000	<20	<20	70
Lead	µg/L as Pb		1.4	0.60	<0.5	0.90
Manganese	µg/L as Mn		2,200	2,000	2,000	1,700
Silver	µg/L as Ag		0.08	0.03	0.25	0.27
Zinc	µg/L as Zn		6,650	4,100	3,390	2,990
Total Recoverable Trace Metals						
Cadmium	µg/L as Cd	/0.4	14	20	14	9.6
Copper	µg/L as Cu	/24	<10	<10	<10	<10
Iron	µg/L as Fe		9,000	4,000	1,000	1,000
Lead	µg/L as Pb	/9.9	3.1	5.4	2.4	4.4
Manganese	µg/L as Mn		2,200	2,100	2,000	1,700
Silver	µg/L as Ag	/0.1	0.14	0.32	0.47	0.38
Zinc	µg/L as Zn	/237	6,870	5,450	4,020	2,970

(1) daily maximum/30-day average - St. Louis Tunnel Outfall 002 Effluent Limitations (CDPS Permit Number CO-0029793, expired January 31, 1999)